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Area Reports: International 2003

Asia and the Pacific

Volume III

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MINERALS YEARBOOK

Area Reports: International 2003

Asia and the Pacific

Volume III

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2003 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

P. Patrick Leahy, Acting Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at URL http://www.usgs.gov or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, International Minerals Section, Minerals Information Team, at (703) 648-7732, or the Team secretary at (703) 648-4961. Additional minerals information may be accessed on the World Wide Web at URL http://minerals.usgs.gov/minerals.

Acknowledgments

The Country Specialists in the Minerals Information Team, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the Minerals Information Team.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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THE MINERAL INDUSTRIES OF ASIA AND THE PACIFIC

By Chin S. Kuo, Travis Q. Lyday, Pui-Kwan Tse, David R.Wilburn, and John C. Wu

Asia and the Pacific in Minerals Yearbook, Volume III—Area Reports: International 2003 covers 31 countries and territories. The total area of the region, which is about 29.9 million square kilometers, is about three times that of the United States (9.6 million square kilometers). In 2003, the region's population totaled about 3.5 billion, which accounted for about 56% of the world total and was about 12 times that of the United States. China and India, which were the world's two most populous countries, accounted for 67% of the region's total population and about 38% of the world total population. In 2003, Japan's economy, which ranked second in the world after the United Sates, amounted to $4.3 trillion as measured by the total gross domestic product (GDP); that of the United States amounted to $10.9 trillion. The economies of China and India, however, were the two fastest growing in the region in 2003 (tables 1, 2).

In 2003, Australia and China were among the world's leading mineral producers. Australia has large resources of bauxite, coal, cobalt, copper, diamond, gold, iron ore, lead, lithium, manganese, mineral sands, nickel, silver, tantalum, uranium, and zinc. China has large resources of antimony, arsenic, barite, coal, copper, fluorite, gold, graphite, iron ore, magnesium, mineral sands, rare earths, silver, strontium, tin, tungsten, and zinc. India also was one of the world's significant mineral producers with large resources of barite, bauxite, chromium, iron ore, manganese, rare earths, and salt. Other significant mineral producers in the region were Indonesia, which has large resources of coal, copper, gold, nickel, and tin; Mongolia, which has large resources of copper, fluorspar, and molybdenum; Papua New Guinea, which has large resources of copper and gold; the Philippines, which has large resources of gold and nickel; and Thailand, which has large resources of feldspar and gypsum.

Despite the large amount and wide variety of regional resources of nonfuel minerals and mineral fuels in Australia, China, India, Indonesia, Mongolia, Papua New Guinea, the Philippines, and Thailand, the regional supplies of numerous nonfuel minerals, such as aluminum, bauxite, copper, gold, diamond, iron ore, lead, platinum-group metals (PGM), phosphate rock, silver, and zinc, and major mineral fuels, such as coal, natural gas, crude petroleum, and refined petroleum products, were insufficient to satisfy the demand in the region. The situation was caused largely by a substantial increase in consumption of nonfuel minerals and mineral fuels by China and India; by such resource-poor industrialized countries as Hong Kong, Japan, the Republic of Korea, Singapore, and Taiwan; and by the growing economies of such middle-income developing countries as Indonesia, Malaysia, and Thailand. The Middle Eastern and North American regions supplied a large percentage of Asia and the Pacific requirements for coal, natural gas, crude petroleum, and refined petroleum products. Africa, North America, and South America supplied a substantial percentage of the region's raw material requirements for ferrous and nonferrous metals.

China and Japan were the two major regional markets for crude and processed minerals. Japan was the region's leading consumer of ferrous and nonferrous metals because of its large manufacturing sector and its poor indigenous resources. China, however, remained the region's strongest consumer in terms of growth in demand, especially for such mineral commodities as aluminum and bauxite, coal, copper, iron and steel, crude petroleum, and natural gas. India, Indonesia, the Republic of Korea, Malaysia, Singapore, Taiwan, Thailand, and Vietnam also were important consumers of such mineral commodities as aluminum, cement, copper, gold, iron ore, lead, phosphate rocks, silver, steel, and zinc.

To accelerate the regional economic growth, social progress, and cultural development and to promote regional peace and stability, the Association of Southeast Asian Nations (ASEAN) was established in 1967. As of 2003, ASEAN's member countries were Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. In 2003, the ASEAN region had a population of about 550 million, a total area of about 4.5 million square kilometers, a combined GDP of $737 billion, and trade valued at $720 billion (Association of Southeast Asian Nations, 2003§[1]).

To enhance economic growth and prosperity for the region and to strengthen the Asia-Pacific community, the Asia-Pacific Economic Cooperation (APEC) was established in 1989. The APEC was the premier forum for facilitating regional economic cooperation, growth, investment and trade. As of 2003, the APEC's member-countries were Australia, Brunei, Canada, Chile, China, Hong Kong, Indonesia, Japan, the Republic of Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Taiwan, Thailand, the United States, and Vietnam. The APEC region had a population of about 2.6 billion, a combined GDP of about 60% of the world's GDP ($19.3 trillion) and about 47% of the world's trade (Asia-Pacific Economic Cooperation, 2003§).

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The U.S. Geological Survey (USGS) acknowledges and thanks the following foreign Government agencies, international institutions, and private research organizations for providing mineral-production statistics, key economic data, and exploration and mineral-related information:

For mineral production statistics:

- Australia—Australian Bureau of Agricultural and Resources Economics and Western Australia Department of Minerals and Petroleum Resources in Australia;
- Brunei—Prime Minister's Department, Petroleum Units;
- Cambodia—Ministry of Industry, Mines and Energy, Department of Mineral Resources Development;

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[1] References that include a section mark (§) are found in the Internet References Cited section.

- India—Indian Bureau of Mines;
- Japan—Ministry of Economy, Trade and Industry, Research and Statistics Department;
- Republic of Korea—Korea Institute of Geoscience and Mineral Resources;
- Laos—Ministry of Industry and Handicraft, Department of Geology and Mines;
- Malaysia—Ministry of Primary Industry, Minerals and Geoscience Department;
- Mongolia—Mineral Resources and Petroleum Authority; and
- Thailand—Ministry of Industry, Department of Primary Industries and Mines.

For key economic data:

- Asian Development Bank in Manila, the Philippines;
- International Monetary Fund in Washington, DC; and
- The World Bank in Washington, DC.

For exploration and other mineral-related information:

- Australian Bureau of Statistics in Canberra, Australia; and
- Metals Economics Group in Halifax, Nova Scotia, Canada.

The projected outlook for production of selected major mineral commodities for 2005 and beyond was based upon supply-side assumptions, such as announced plans for capacity expansion, ongoing new capacity construction, and bankable feasibility studies. No explicit consideration of any demand-side factors, such as price and economic growth, was made.

General Economic Conditions

In 2003, the overall performance of the region's economy was, in terms of the average rate of real GDP growth, about 4% compared with 3.6% in 2002. China's economy continued to rank the highest in the region at 9.1% followed by India, 7.2%, and Thailand, 6.8%. Japan, which was the world's second ranked economy, also registered growth of 2.5% compared with 0.2% in 2002. The economies of Australia and New Zealand and of such newly industrialized economies as the Republic of Korea, Singapore, and Taiwan experienced slower economic growth than in 2002. The economic performance of such developing countries as Fiji, Indonesia, Malaysia, Mongolia, Pakistan, Papua New Guinea, the Philippines, Sri Lanka, and Vietnam, however, was generally better than that of developed countries with real GDP growth rates of between 5% and 6% in 2003.

Of the 31 countries and territories in the region, Australia ranked the richest with a per capita GDP based on purchasing power parity of $29,143 followed by Japan, $28,162; Hong Kong, $28,027; Singapore, $24,480; and Taiwan, $23,773. East Timor was the poorest with a per capita GDP based on purchasing power parity of $543 following Afghanistan, with $700; North Korea, $1,308; Nepal, $1,418; and Burma, $1,519. China ranked as the region's largest economy, in terms of total GDP based on purchasing power parity, at about $6.4 trillion followed by Japan at about $3.6 trillion; India, at about $3.1 trillion; the Republic of Korea, at about $858 billion; and Australia, at about $580 billion (table 2).

The economies of the developing Asian countries were expected to continue to perform better than the developed and newly industrialized Asian countries but could grow at a slower pace during the next 2 to 3 years. According to the International Monetary Fund, China's real GDP was projected to grow by 8% in 2006 followed by Vietnam, 7%; Laos, 6.5%; and India, 6.4% (table 2). Among the newly industrialized countries, the Republic of Korea was projected to grow by 5.2% in 2006 followed by Singapore, 4.5%, and Taiwan, 4.3%. Among the Southeast Asian countries, Malaysia and Thailand were projected to grow by 6.2% each in 2006 followed by Indonesia, 6%, and the Philippines, 4.5%. The economies of the Pacific countries were projected to grow at a much slower rate; Australia was projected to grow by 3.3% in 2006 followed by New Zealand, 2.6%, and Fiji and Papua New Guinea, 2.3% each.

Investment Interest and Political Risk

China continued to invest heavily in expanding its mineral industry's production capacity, especially in aluminum, cement, iron ore, and steel. To prevent duplicate investment and nonperforming loan problems and to maintain China's financial stability, the Ministry of Land and Resources froze land supply for building villas, and the Chinese Central Bank raised the required reserves ratio on commercial banks to 7% from 6%. In 2003, the Government issued a circular to commercial banks to curb credit and expansion investment projects related to the aluminum, cement, and iron and steel sectors. The State Council raised the lending criteria for aluminum, cement, and steel projects by requiring more equity investment. In 2003, the minimum equity ratio for steel rose to 40% from 25%, and that of aluminum and cement, to 35% from 20%.

In 2003, investment in Mongolia was focused mainly on copper and gold. The privately owned Ivanhoe Mines Ltd. of Canada and the state-owned China International Trust & Investment Corp. of China agreed to form a strategic alliance (joint venture) for mineral exploration, development, and production projects. In 2003, Ivanhoe completed the feasibility study for the development of two gold-rich open pit mines at Oyu Tolgoi in Umnogovi Aimag in the southern Gobi area. The initial capital investment of about $530 million would be spent for the first stage of the project during which between 300,000 and 400,000 metric tons per year (t/yr) of copper concentrates and 12.5 t/yr of gold would be produced.

India continued to invest in expanding the aluminum smelter's capacity at Renukoot in the State of Uttar Pradesh. The country planned to double the capacities of the lead and zinc smelters at Chanderiya in the State of Rajasthan and to invest a total of about $980 million in two phases to expand its steel production capacity in the State of Jharkhand. India also was to begin a $390 million deepwater exploration campaign in the first quarter of 2004 and was expected to spend $1.2 billion per year thereafter in oil exploration to increase its petroleum production from deepwater oilfields.

In the Republic of Korea, Pohang Iron and Steel Co. Ltd. planned to invest a total of $11.3 billion during the next 5 years to expand its steel production capacity, develop value-added steel products, and implement a next-generation ironmaking process called FINEX® technology, which had been developed by Voest-Alpine Industrieanlagenbau of Austria.

In Malaysia, MASCO Aluminum Sdn. Bhd. planned to build a $3.42 billion aluminum smelter to produce 690,000 t/yr of primary aluminum in the State of Perak. In Laos, Oxiana Ltd. of Australia was expected to invest an additional $235 million in late 2004 or early 2005 for the development of a copper mine and the building of a processing plant at the Khangong deposit adjacent to its Sepon gold mine to produce copper and gold. In Vietnam, Tiberon Minerals Ltd. of Canada was expected to invest about $140 million during the next 2 to 3 years for the development of a tungsten-fluorite mine at the Nui Phao deposit.

Legislation

To attract foreign investment in mineral development and production in China, the Government urged the National People's Congress to amend the mineral resources law, which had been enacted in 1986 and amended previously in 1996. Under this law, prospectors have mining rights, but how such rights can be guaranteed is not explained clearly. In 2003, the Ministry of Land and Resources established a mineral resources law consultant committee to seek recommendations from domestic and overseas mining law experts for proposing changes to redefine mineral rights.

In India, the Government reduced the basic tariff on imported metallurgical coke to 5% from 15% and abolished the tariff on metallurgical coke imported from China. The Government also reduced import traffic on polished diamond and gemstones to 5% from 15% and reduced the custom duty on gold bars and coins to $2.10 per 10 grams in 2003 from $5.25 per 10 grams in 2002. In the Republic of Korea, the Government reduced the import tariff on such raw materials as coal and ore and concentrates of copper, iron, lead, manganese, titanium, and zinc and on such processed minerals as primary aluminum, refined copper, nickel oxide, and pig iron effective July 2003. By the end of December 2003, the Government was to submit an amendment to the National Assembly for approval to reduce the tariff to zero on raw materials for the production of ferrous and nonferrous metals.

In Indonesia, the drafting of a proposed new mining law was completed by the Ministry of Energy and Resources (MER) and submitted to the State Secretariat for approval before submission to the House of Representatives to be legislated into law. The new mining law would replace General Mining Law No. 11/1967. The replacement was considered to be necessary because the old law was not compatible with conditions in the mining sector. The MER withdrew the draft at yearend 2003, however, but planned to set up a technical team to redraft a new mining law.

In Mongolia, the Parliament approved amendments to the Law of Corporate Income Tax. The corporate income tax ceiling under the amendment was to be reduced to 30% from 40% effective January 1, 2004. Various tax incentives for foreign investment companies, however, would be terminated. The Government submitted a proposed amendment to the Parliament in December 2003 that would abolish the 10% value-added tax on gold sales and change the royalty for extraction of hard-rock minerals deposits to 2.5% and of placer gold deposits to 7.5%. In Sri Lanka, the Parliament approved the Petroleum Resources Bill, which allows the private sector to invest in oil and gas exploration to exploit the country's petroleum resources and to share profits with foreign and local companies.

Exploration

Exploration activity in much of Asia and the Pacific increased slightly in 2003 from the 2002 levels but remained at significantly lower levels than the high levels of 1997. Data derived from the Metals Economics Group (MEG) annual survey suggest that the 2003 proposed budget for Australian exploration activity of about $339 million was 11% higher than the $304 million reported by the MEG in its 2002 survey. Similarly, the 2003 budget for the Pacific region countries (excluding Australia) of about $93 million was about 9% higher than the corresponding 2002 exploration budget. The estimate for the exploration budget for Asia was reported to be $84 million in 2003 by the MEG, which was up by about 50% from the $56 million reported for 2002 (Metals Economics Group, 2003a, b).

Although the MEG estimates of recent Australian mineral exploration expenditures showed a slight increase in 2003, Australian activity has declined from a 1997 peak period of activity. The MEG estimate for the 2003 Australian exploration budget allocations declined to 15.5% of the total world exploration budget in 2003 from 17.6% in 2002. The Western Australia Department of Industry and Resources (2003a) reported minerals exploration expenditures for 2002 to be $442 million, as compiled by the Australian Bureau of Statistics (ABS); exploration in Western Australia accounted for 58% of these expenditures, or about $258 million.

According to the ABS, as reported by the Australian Bureau of Agricultural and Resource Economics (2004§), gold accounted for 52% of Australia's mineral exploration expenditure in 2002-03. Exploration allocations for base-metal targets in Australia accounted for about 16% during the same period. Comparing the periods from June 2001 to June 2002 and June 2002 to June 2003, Australian minerals exploration expenditures varied significantly by mineral sector. The largest expansion in exploration expenditure was in the gold sector, which increased by 12%, or about $18 million for this period. Gains also were made in the iron ore sector, which increased by 42%, or about $5.1 million, and the base-metal and silver sectors, which increased by 17%, or $6.8 million. The diamond exploration sector decreased by 41%, or about $8.1 million for the period. Other sectors remained close to their 2001-02 levels (Western Australia Department of Industry and Resources, 2003b).

After Western Australia, exploration in Australia was focused on the States of Queensland, New South Wales, and South Australia and the Northern Territory. South Australia saw gains in 2003 as a result of extensive work conducted on the

Prominent Hill copper/gold project and the completion of the Targeted Exploration Initiative South Australia program conducted by the Department of Primary Industries and Resources, South Australia (MineBox, 2003c§). The site data compiled by the USGS for this report also suggest these areas had the highest level of exploration activity in Australia.

Native title claims issues continued to affect Australian exploration and mining. The Native Title Act of 1993 provided the framework for determinations of native title. The process for determining whether native title applies and the resolution of native title claims, however, have been slow. As of September 22, 2003, 46 native title determinations have taken place in Australia; about two-thirds of these supported the rights of native title claimants. As of October 8, 90 indigenous land-use agreements had been negotiated in Australia, of which 60% related to Queensland (Fooks and Sun, 2003). In 2003, Queensland adopted an expedited process for dealing with mining exploration permits in return for guaranteed protection for cultural heritage values on land subject to native title (MineBox, 2003b§). The Western Australia State Government has invested more than $1.8 million to speed up the processing of mineral tenement applications on land under native title claim. The Northern Territory State Government committed $9.9 million to enhance understanding of the regional geology; to improve community education, land access, and mineral tenure; and to strengthen interest in onshore and offshore petroleum acreage. The maximum exploration expenditure deduction on mineral royalties in the Northern Territory was reduced from 25% to 35% during 2003 (MineBox, 2003a§).

Budget allocations for mineral exploration in other countries in Asia and the Pacific expressed as a percentage of the world's exploration budget continued to decrease in 2003 to 4.2%, which was about one-half of the level of this region in 2000. The exploration budget allocation for 2003 reported by the MEG was about $93 million, which was up slightly in dollar terms from the 2002 level of $85 million. Gold budgets for Asia and the Pacific rose slightly to $43 million in 2003 from $31 million in 2002 after declining steadily for several years. Risk aversion caused largely by political instability was primarily responsible for the drop in dollar allocation for gold exploration in the region from a high of $319 million in 1997 (Metals Economics Group, 2003a). In Southeast Asia, aggressive drilling programs were reported in Laos at the Sepon gold-copper deposit, in the Philippines at the Boyongan gold-copper deposit, and in Thailand at the Chatree/Prospect A gold-silver deposit.

On the basis of data collected during 2002 and 2003, exploration activity in Asia and the Pacific (excluding Australia) was greatest in the Philippines, where it was associated mostly with established or developing mining areas. Other activity also took place in Indonesia and Papua New Guinea. Gold targets accounted for about 80% of all exploration interest in the Pacific region, and base-metal targets accounted for 13% of the reported activity in 2003.

Japan announced plans to spend $88 million to conduct a large-scale marine minerals survey of the continental shelves off the coast of Japan. Under the 1983 U.N. Convention on the Law of the Sea, a coastal state may claim rights to the resources of a continental shelf beyond its 200-nautical-mile exclusive economic zone provided there is geographical continuity of the seabed (Pay Dirt, 2003).

Within Asia, base-metals and gold exploration was focused on China and Mongolia. Mineral exploration in China has increased since the country opened its mining sector to foreign investment during the 1990s. China's manufacturing base relies on raw materials, and its domestic mining industry is unable to develop fast enough to keep pace with increased mineral demand generated by its high rate of economic growth. Between January and June 2003, 2,693 exploration and mining licenses were issued compared with 20 exploration licenses and 320 mining licenses between 1998 and 2001 (Mining Journal, 2003).

Chinese mining laws and regulations that pertain to joint ventures with foreign mining companies continued to evolve slowly but positively from an international investment perspective (Mining Journal, 2003). The Government has issued guidelines to allow foreign enterprises to conduct Chinese mineral exploration activities. The Ministry of Land and Resources has developed a long-term program for mineral development; 10 major areas in western China have been designated for exploration and exploitation.

Commodity Overview

The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported, and revisions are not identified.

Metals

Aluminum and Bauxite and Alumina.—The region's production of bauxite accounted for about 54% of the world total in 2003. Australia, which was the world's leading producer of bauxite, accounted for 38% of the world total; it was followed by China, 9%, and India, 7%. Production of primary aluminum accounted for about 32% of the world total in 2003. China, which was the world's leading producer of primary aluminum, accounted for 18% of the world total; it was followed by Australia, 6%, and India, 2% (table 4).

Japan produced no bauxite and insignificant amounts of primary aluminum but continued to be one of the region's leading consumers of bauxite and one of the world's major consumers of primary aluminum in 2003. Japan imported more than 2 million metric tons (Mt) of bauxite mainly from Australia (56%), Indonesia (34%), and India (7%). Japan imported 2.9 Mt of primary aluminum mainly from Australia (20%), China (9%), New Zealand (7%), and Indonesia (5%) within Asia and the Pacific and from Russia (24%) in Europe and Central Eurasia; about 46% of Japan's imported primary aluminum was from Japan's 11 overseas aluminum smelter projects in which Japanese aluminum and major trading companies held substantial equity shares. Japan, which was the region's leading producer of secondary aluminum, accounted for 76.4% of the regional total and about 16% of the world total in 2003.

Regional production of primary aluminum and bauxite was expected to continue to grow at an average annual rate of about 6% and 4%, respectively, between 2003 and 2009 (tables 5, 6). This prediction was based on reported capacity expansions in Australia, China, and India. Regional production of secondary aluminum was predicted to remain at the 1.5-Mt level with a slight decrease in estimated production in Japan and a gradual increase in estimated production in China (table 7).

In Australia, capacity expansions included the construction of a 1.4-million-metric-ton-per-year (Mt/yr) alumina refinery and a 450,000-t/yr aluminum smelter by Comalco Ltd. at Gladstone, Queensland. In China, capacity was expanded at several enterprises, which included an alumina refinery to 850,000 t/yr in 2003 from 800,000 t/yr in 2002 at Pingguo, Guangxi Province, by Aluminum Corp. of China Co. Ltd. (Chalco); a 150,000-t/yr smelter to be constructed by 2005 in Lanzhou, Gansu Province, by Lanzhou Aluminum Co. Ltd.; an aluminum smelter to 380,000 t/yr from 130,000 t/yr by 2006 at Pingguo, Guangxi Zhang Autonomous Region, by a joint venture of Chalco and Alcoa Inc. of the United States; and the development of a bauxite mine, construction of an 800,000-t/yr alumina refinery, and completion of a 250,000-t/yr aluminum smelter by 2006 in Bose, Guangxi Zhang Autonomous Region, by Guangxi Guixi Huayin Aluminium Corp., which was a joint venture of Chalco, Minmetals Nonferrous Metals Co. Ltd., and Guangxi Investment Ltd. In the State of Orissa in India, capacity expansions included the ongoing expansions of a bauxite mine and an alumina refinery to 4.8 Mt/yr and 1.6 Mt/yr, respectively, at Dhamanjodi; an aluminum smelter to 525,000 t/yr at Angul by National Aluminium Co. Ltd.; and an aluminum smelter to 57,200 t/yr from 30,000 t/yr in 2003 by Indian Aluminium Co. Ltd. at Hirakud. Hindalco Industries Ltd. expanded the capacity of an aluminum smelter at Renu Koot, State of Uttar Pradesh, to 342,000 t/yr in 2003 and planned to expand it to 360,000 t/yr in 2005. Bharat Aluminium Co. Ltd. proposed to expand the capacities of an alumina refinery to 830,000 t/yr from 200,000 t/yr and an aluminum smelter to 334,000 t/yr from 100,000 t/yr; both facilities were located at Korba, State of Chhattisgarh.

Copper.—The region's production of mined copper accounted for about 21% of the world total in 2003. Indonesia, which was the leading regional producer and the world's third ranked producer of mined copper, accounted for 7% of the world total; it was followed by Australia, 6%, and China, 5%. Production of primary refined copper metal accounted for about 33% of the world total primary refined copper production in 2003. Among the region's refined copper producers, China, which was the world's second ranked producer of primary and secondary refined copper metal, accounted for 12% of the world total in 2003; Japan, which ranked third, accounted for 9%. Australia and the Republic of Korea, which also were important producers of refined copper metal, accounted for 4% and 3%, respectively, of the world total in 2003 (table 4).

Japan was one of the world's major import markets for copper concentrates. The country imported more than 4 Mt of copper concentrates and accounted for more than 30% of copper concentrates traded in the world in 2003. China was one of the world's major import markets of copper concentrates and refined copper. China imported about 2.7 Mt of copper concentrates and about 1.4 Mt of refined copper and accounted for about 20% each for copper concentrates and refined copper traded in the world in 2003. Another important consumer of copper concentrates in the region was the Republic of Korea, which imported about 1.3 Mt of copper concentrates and accounted for 10% of copper concentrates traded in the world in 2003. Australia, Indonesia, Mongolia, and Papua New Guinea were the major regional suppliers of copper concentrates to China, Japan, and the Republic of Korea. Japan, Indonesia, and the Philippines were the region's major suppliers of refined copper to China and other Southeast Asian countries.

Regional production of refined copper metal and mined copper was expected to continue to increase at an average annual rate of 5% and 4%, respectively, between 2003 and 2009. This prediction was based on reported capacity expansions of mined copper in Australia and Indonesia, as well as Burma, Laos, Thailand, and Vietnam, and on reported capacity expansions of refined copper metal in China and Japan, as well as Burma, Laos, Thailand, and Vietnam (tables 8, 9).

In Australia, gradual capacity expansions were to be undertaken by MIM Holdings Ltd. at Mount Isa in Queensland and by WMC Olympic Dam Operations Pty., Ltd. at Olympic, State of South Australia. In Indonesia, gradual capacity expansions were to be undertaken by P.T. Freeport Indonesia Co. at Grasberg, Province of Papua, and by P.T. Newmont Nusa Tenggara at Batu Hijau on Sunbawa Island, Province of West Nusa Tenggara. In China, Jiangxi Copper Co. Ltd. increased its refining capacity to 400,000 t/yr in 2003 from 200,000 t/yr in 2002 at Guixi, Jiangxi Province; Yunan Copper Group Co. Ltd. planned to increase its refinery capacity to 350,000 t/yr from 160,000 t/yr at Kunming, Yannan Province, by 2005. Refined copper capacity increases of 6,000 t/yr, 30,000 t/yr, and 50,000 t/yr would be added by Shanghai Xinfengneng Industrial Co. Ltd. in Hami, Xinjiang Uygur Autonomous Region, in 2004, 2006, and 2007, respectively; and 200,000 t/yr of blister copper by Baotou Huading Copper Development Co. Ltd. in Baotou, Nei Mongol Autonomous Region, in 2004. Tongling Nonferrous Metals Co. planned to expand its copper refining capacity to 450,000 t/yr from 310,000 t/yr in the next 3 years. In Japan, Sumitomo Metal Mining Co. Ltd. expanded the capacity of its Toyo Smelter and Refinery to 300,000 t/yr in 2003 and planned to increase the capacity gradually to 450,000 t/yr by 2008. In Burma, Myanmar Ivanhoe Copper Co. Ltd. planned to develop the Letpadaung deposit in the Monywa area and to increase its capacity to 125,500 t/yr of copper cathodes from 25,000 t/yr in five stages between 2005 and 2009. In Laos, Oxiana Ltd. of Australia planned to develop a copper mine and to build a processing plant at the Khanong deposit to produce 60,000 t/yr of copper cathodes by 2006. In Thailand, Pan Australian Resources N.L. of Australia, in joint venture with Padaeng Industry Public Co. of Thailand, planned to develop a copper mine and to build a processing plant at their PUT 1 deposit, which could begin operations at the capacity of 30,000 t/yr of copper cathodes by 2008. Thai Copper Industries PLC planned to commission its new 165,000-t/yr copper smelter and refinery in Rayong by mid-2004. In Vietnam, Vietnam National Minerals Corp. began construction work on a copper mine and smelter at Sin Queyen, Province of Lao Cai, to produce 42,000 t/yr of copper concentrate and 10,500 t/yr of refined copper by 2005 or 2006.

Gold.—The region's production of mined gold accounted for about 31% of the world total in 2003. Australia, which ranked third in production of mined gold, accounted for 11% of the world total; it was followed by China, which was ranked fourth in the world and accounted for 8%, and Indonesia, which was ranked seventh in the world and accounted for 5% in 2003. The region's production of mined gold increased by 68% between 1990 and 2000 and by 8% between 2000 and 2003 (table 10).

In 2003, Australia's gold reserves ranked second after those of South Africa. Production of mined gold in Australia was mainly from several large-scale open pit gold mines in Western Australia and from more than 40 active gold and copper mines located in almost every State of Australia. In 2003, production of mined gold in China reached a record high of more than 200 metric tons (t), and that of Indonesia declined slightly. Production of mined gold in Japan, Mongolia, New Zealand, Papua New Guinea, and the Philippines remained steady in 2003. Laos opened its first gold mine with a capacity of 5 t/yr at Sepon, Province of Savannakhet, in 2003. In 2001, Thailand had opened a small gold mine at Chatree, Province of Phichit, with a capacity of 4.5 t/yr and was expanding its capacity in 2003.

Asia and the Pacific was the world's major market for gold. India was the world's leading consumer of gold; it was followed by Japan and China. In 2003, India was estimated to consume about 570 t of gold; Japan, about 360 t; and China (including Hong Kong), about 320 t.

Regional production of mined gold was expected to continue to increase at an average annual rate of 2.5% between 2003 and 2009. This prediction was based on gradual capacity expansions mainly at the major copper and gold mines in Australia, China, and Indonesia. Production of mined gold in Japan, Mongolia, New Zealand, Papua New Guinea, the Philippines, Laos, and Thailand was predicted to hold steady from 2003 to 2006 and to increase slightly with gradual capacity expansions of gold and copper mines between 2007 and 2009 (table 10).

Iron and Steel.—The region's production of iron ore was estimated to account for, in terms of metal content, about 40% of the world total in 2003. Australia ranked second in the world as a producer of iron ore; it was followed by China and India. The region's production of pig iron and direct-reduced iron (DRI) was estimated to account for about 58% of the world total. China, which ranked as the world's leading producer of pig iron, accounted for 29% of the world total; it was followed by Japan, which accounted for 12%. The region's production of crude steel was estimated to account for about 49% of the world total. China, which was by far the world's leading producer of crude steel, accounted for 23% of the world total; it was followed by Japan, which accounted for 12% (table 4).

China was the world's leading consumer and importer of iron ore in 2003. The country imported more than 148 Mt of iron ore to meet the raw material requirements of its expanding steel industry. Japan produced almost no iron ore but was the world's second ranked consumer and importer of iron ore; more than 130 Mt of iron ore was imported in 2003. The Republic of Korea was another significant consumer and importer of iron ore in the region; about 43 Mt of iron ore was imported in 2003. Australia was the region's leading supplier of iron ore in Asia and the Pacific; it was followed by India.

Regional production of iron ore was expected to increase at an average annual rate of 3.5% between 2003 and 2009. This prediction was based on gradual capacity expansions in Australia, China, and India. Such expansions in Western Australia would be at the Channar and the Hamersley operations of Hamersley Iron Pty. Ltd.; the Mount Goldsworthy, the Mount Newman, and the Yandi operations of BHP Billiton Iron Ore Pty. Ltd.; the Mesa J and the West Angeles (Pannawonica) operations of Robe River Iron Associates; and the Jimblebar operation of BHP Iron Ore (Jimblebar) Pty. Ltd. In China, gradual expansion would be at Qian'an, Hebei Province, by Shoudu Mining Co.; at Ansan and Benxi, Liaoning Province, by Ansang Mining Co. and Benxi Iron and Steel Co., respectively; at Baotou, Nei Mongol Autonomous Region, by Baotou Iron and Steel and Rare Earth Co.; at Panzhihua, Sichuan Province, by Panzhihua Mining Co.; at Maanshan, Anhui Province, by Maanshan Iron and Steel Co.; and at Changjiang, Hainan Province, by Hainan Iron Mine. Other reported iron-ore-capacity expansions in China included the Dahongshan Mine at Yuxi, Yunnan Province; at the Jinshandian Mine, Hubei Province; at the Baima Mine, Sichuan Province; at the Menjiagou Mine, Qian'an Province; at the Heigou Mines, Gansu Province; and at the Caolou Mine, Anhui Province. In India, a large new iron ore mine at Gandhamardan Malanjtoli, State of Orissa, was scheduled to start production in 2006 (table 11).

China was the world's leading consumer of iron and steel products. The country imported more than 45 Mt of iron and steel products in 2003. Japan was the world's leading exporter and the region's major supplier of iron and steel products to China and such major consumers in the region as the Republic of Korea, Singapore, Taiwan, and Thailand.

Regional production of pig iron and DRI was expected to increase at an average annual rate of 4% between 2003 and 2009. This prediction was based on the reported capacity expansions mainly at Caofeidian and Qian'an, Hebei Province, by Shoudu Iron and Steel Group Co. and at Ningbo, Zhejiang Province, by Hangzhou Iron and Steel Co. Ltd., in China and at Nagamar, State of Chhattisgarh, and Jamshedpur, State of Bihar, in India. Pig iron production in Japan and the Republic of Korea was expected to hold steady between 2003 and 2009 (table 12).

Regional production of crude steel was expected to increase at an average annual rate of 3.5% between 2003 and 2009. This prediction was based on reported capacity expansions mainly at Caofeidian and Qian'an, Province of Heibei, by Shoudu Iron and Steel Group and at Hangzhou and Ningbo, Province of Zhejiang by Hangzhou Iron and Steel Group Co. in China and at Jamshedpur, State of Bihar, and in the State of Jharkhand by Tata Iron and Steel Co. Lt. in India (table 13).

Lead and Zinc.—The region's production of mined lead and zinc accounted for about 54% and 41%, respectively, of the world total in 2003 (table 4). Australia's lead reserves ranked as the world's largest; those of China ranked second. Australia's zinc reserves were the world's largest, and those of China were estimated to be about the same as those of Australia in 2003.

China, which ranked as the world's leading producer of mined lead and zinc, accounted for more than 29% and 21%, respectively, of the world total in 2003; it was followed by Australia, which accounted for more than 21% and 17%, respectively. India and North Korea were the region's other important producers of mined lead and zinc; their production levels held steady in 2003 (table 4).

China, which ranked as the world's leading producer of primary lead and primary zinc, accounted for more than 36% and 23% of the world total, respectively, in 2003. Australia, India, Japan, and the Republic of Korea were the region's other important producers of primary lead and slab zinc. China and Japan were among the world's major producers of secondary lead in 2003 (table 4).

China was the world's second ranked consumer of primary and secondary lead after the United States in 2003. Consumption of primary and secondary lead in China reached a record high of more than 1 Mt. The substantial growth in demand for lead during the past several years was due to the continuing increase in demand for storage batteries by the growing number of automobile producers in China. Consumption of primary slab zinc in China reached 2 Mt, which also was a record high. Japan and the Republic of Korea were the region's other important consumers of primary and secondary lead and primary slab zinc; their demands for lead and zinc have remained relatively steady during the past several years.

Regional production of mined zinc and lead was expected to increase at an average annual rate of 3% and 2%, respectively, between 2003 and 2009. This prediction was based on reported capacity expansions in Australia, China, and India (tables 14, 25). Regional production of zinc metal and primary and secondary refined lead was expected to increase at an average annual rate of 2.5%, 2.2 %, and 2.0 %, respectively, between 2003 and 2009. This prediction was based on gradual capacity expansions mainly in China (tables 15, 16, 26).

In Australia, gradual capacity expansions were expected to be carried out at the Cannington Mine in Queensland by BHP Minerals Ltd. and at the George Fisher and the Hilton Mines at Mount Isa, Queensland, by MIM Holdings Ltd.

In China, reported capacity expansions were for a new lead-zinc mine in Nei Mongol Autonomous Region by Dongshenmiao Lead and Zinc Mining Co.; a new lead-zinc mine at Lanping, Yunnan Province, by Yunnan Jinding Zinc Co. Ltd.; the lead smelter and refinery at Jiyuan, Henan Province, by Yuguang Gold and Lead Co. Ltd.; the zinc smelter in Hunan Province by Jinshi Mining Co. Ltd.; the zinc smelter and refinery at Chifeng, Nei Mongol Autonomous Region, by a joint venture of Biyinnuoer Lead and Zinc Co., Chifeng Hongye Zinc Smelter Co. Ltd., and Kumba Resources Ltd. of South Africa; the lead and zinc smelters and refineries at Baiyin, Gansu Province, by Baiyin Nonferrous Metals Co. Ltd.; and the lead smelter at Hengyang, Hunan Province, by Shuikoushan Nonferrous Metals Co. Ltd.

In India, reported capacity expansions were for the Rampura Agucha lead and zinc mine in the State of Rajasthan and for the lead and zinc smelters at Chanderiya, State of Rajasthan, by Hindustan Zinc Ltd. Three shuttered secondary lead plants, of which two were in Maharashtra and one was in West Bengal, were reported to have been restarted by Indian Lead Co. Ltd.

Nickel.—The region's production of mined nickel, in terms of metal content, accounted for about 39% of the world total in 2003. Australia ranked first in nickel reserves and was the world's second ranked producer of mined nickel after Russia in 2003. Indonesia and New Caledonia, which were the region's other major producers of mined nickel, accounted for 10% and 9%, respectively, of the world total (table 4).

Japan was the world's leading consumer and importer of nickel ore and nickel matte; more than 4 Mt/yr of nickel ore (gross weight) was imported from Indonesia, New Caledonia, and the Philippines for the production of ferronickel. Japan imported more than 100,000 t/yr of nickel matte from Australia and Indonesia for the production of refined nickel metal and chemicals. The country was the world's second ranked producer after Russia of primary nickel, which included chemicals, ferronickel, nickel oxide sinter, and pure nickel metal. China also was a key regional consumer and importer of nickel ore, matte, and pure metal.

Regional production of mined nickel was expected to continue increasing at an average annual rate of 3% between 2003 and 2009. This prediction was based on reported gradual expansions of capacity and increases in productivity (table 17). In Western Australia, sulfide concentrates were being produced at Black Swan by Outokumpu Exploration Ventures Pty. Ltd., at Cosmos by Jubilee Mines NL, and at Kambala, Leinster, and Mount Keith by WMC Ltd. Anaconda Nickel Ltd. was using high-pressure acid leaching to extract nickel. In China, gradual capacity expansion was to be undertaken at Jinchuan, Gansu Province, by Jinchuan Nonferrous Metals Corp. In 2003, Baoshan Iron and Steel Group Co. and Yunnan Kunneng Co. Ltd. reached an agreement to develop a nickel mine in Yuanjiang County, Yunnan Province, and to build a 10,000-t/yr nickel refinery by 2008. Sumitomo Metal Mining Co. Ltd. of Japan was constructing a greenfield hydrometallurgical plant to extract nickel from low-grade ores stockpiled at the Rio Tuba Mine on Palawan Island in the Philippines. Inco Limited of Canada began construction of a new large-scale mining and hydrometallurgical nickel-cobalt extraction complex at Goro in New Caledonia; the Goro complex was scheduled to be operational in September 2007. Falconbridge Ltd. was evaluating the Koniambo deposit near Kone in the Northern Province of New Caledonia.

Platinum-Group Metals.—The region's production of mined palladium and platinum was insignificant and accounted for only 0.7% and 0.3%, respectively, of the world total in 2003 (table 4). China produced palladium and platinum as byproduct of mined nickel by Jinchuan Nonferrous Metals from its nickel mining and refining operations at Jinchuan, Gansu Province. Australia was not a primary producer of PGM, although small amounts of palladium were produced from Western Australia's Eastern Goldfield at Kalgoorlie-Boulder and Kambalda as a byproduct of the nickel operations.

In 2003, Japan was by far the world's leading consumer and importer of PGM. The country imported about 59 t of palladium and 49 t of platinum and consumed about 43 t of platinum and 42 t of palladium. Its consumption of palladium and platinum was estimated to account for 25.7% and 21.1%, respectively, of the world total.

Regional production of mined platinum was expected to increase at an average annual rate of 4% between 2003 and 2009. This prediction was based on gradual capacity expansion of mined nickel in China (table 18). Regional production of mined palladium was expected to increase at an average annual rate of 3% between 2003 and 2009. This prediction was based on gradual capacity expansion of mined nickel in Australia and China (table 19).

Silver.—The region's production of mined silver accounted for about 27% of the world total in 2003. Silver reserves in Australia and China were estimated to account for about 11% and 10%, respectively, of the world total. China and Australia, which ranked third and fourth among the world's top eight producers of mined silver, accounted for about 12% and 10%, respectively, of the world total in 2003.

In Asia and the Pacific, mined silver was produced mainly from Australia's sole primary silver mine at Cannington, Queensland, and from China's primary silver mines at Yintongzi, Shaanxi Province, and at Poshan, Henan Province. Most of the mined silver in the region, however, was produced as a coproduct of copper or gold or lead and zinc mining operations in Australia, China, Indonesia, Japan, and Papua New Guinea.

Japan was the world's second ranked consumer of silver after the United States. The country consumed about 2,700 t of silver metal, which accounted for about 10% of the world total in 2003.

Regional production of mined silver was expected to increase at an average annual rate of about 5% between 2003 and 2009. This prediction was based on reported gradual capacity expansions of copper, gold, and lead-zinc mines in Australia and China (table 20).

Tin.—Asia and the Pacific was the world's dominant producing region for mined tin and refined tin metal. Production of refined tin metal and mined tin accounted for about 74% and 71%, respectively, of the world total in 2003. Regional production of mined tin in 2003 was higher than that of 2002 because of higher prices, which resulted from shortages of tin concentrate and stronger demands for tin worldwide. China ranked first in production of mined tin and refined tin metal and was estimated to have accounted for about 39% and 36%, respectively, of the world total production in 2003. Indonesia, which ranked second, accounted for 27% and 24% of the world's production of mined tin and refined tin metal, respectively. Other important mined tin producers in the region were Australia, Malaysia, and Vietnam. Other significant refined tin metal producers were Malaysia and Thailand in 2003 (table 4).

In 2003, China, which was the world's second ranked consumer of refined tin metal, accounted for about 24% of the world total. Japan followed with 9%. The major exporters of refined tin were, in decreasing order, Indonesia, China, Malaysia, and Thailand. Japan, which was the world's second ranked importer of refined tin metal after the United States, was estimated to have accounted for about 16% of the world total of refined tin in 2003.

Regional production of mined tin was expected to increase at an average annual rate of only 0.5% between 2003 and 2009. This prediction was based on capacity expansions for mined tin at No. 105 deposit in Nandan, Guangxi Zhuang Autonomous Region, by Gaofeng Mining Co. Ltd. (table 21). Regional production of refined tin metal was expected to increase at an average annual rate of about 3% between 2003 and 2009. This prediction was based on reported capacity expansions at the Koba smelter of P.T. Koba Tin, several small local smelters on Bangka Island in Indonesia, and the Butterworth smelter of Malaysia Smelting Corp. Bhd. in Penang, Malaysia (table 22).

Titanium.—The region's production of mined ilmenite accounted for about 40% of the world total in 2003. Australia, which was the world's leading producer of ilmenite, accounted for about 24% of the world total; it was followed by China, 8%, and India, 6%. In Australia, ilmenite was produced from heavy mineral sands that contained ilmenite, leucoxene, and rutile mostly in Western Australia. The major ilmenite producers were Cable Sands (WA) Pty. Ltd., Iluka Resources Ltd., Kerr McGee Corp., and Ticor Ltd. In China, ilmenite was produced from heavy sands in the southeastern coastal area of the Provinces of Guangdong and Hainan and the Guangxi Autonomous Region and in the southwestern Provinces of Suchuan and Yunnan. In India, state-owned India Rare Earths Ltd. operated mines at Chavara, State of Kerala; at Ganjam, State of Orissa; and at Manavalakurichi and Kanyakumari, State of Tamil Nadu.

Japan was the region's leading consumer and importer of ilmenite. Other important consumers in the region were China, the Republic of Korea, and Taiwan. The region's leading suppliers of ilmenite to Japan, were, in decreasing order of amount, Vietnam, Australia, and India.

Regional production of mined ilmenite was expected to increase at an average annual rate of about 9% between 2003 and 2009. This prediction was based mainly on new capacity development in Australia—at the Ginkgo minerals sands deposit in the Murray Basin of New South Wales by BeMaX Resources NL, the Wemen Mine in Victoria by Murray Basin Titanium Pty. Ltd., and the Dardanup mineral sands deposit in Perth, Western Australia, by Doral Mineral Sands Pty. Ltd. (table 23).

Tungsten.—The region's production of mined tungsten accounted for about 88% of the world total. In 2003, China, which was the world's leading producer of mined tungsten, accounted for about 86% of the world total production. North Korea was another important producer of mined tungsten in the region (table 4).

The world's leading importer and consumer of mined tungsten and such intermediate products as ammonium paratungstate (APT), Japan imported about 420 t of tungsten ore and concentrate and 3,400 t of APT in 2003 for the production of tungsten metal powder and oxide to meet its raw material requirements for the iron and steel and tungsten metal industries. China was the world's dominant supplier of APT to Japan.

Regional production of mined tungsten was expected to increase at an average annual rate of about 1% between 2003 and 2009. This prediction was based on gradual capacity expansion through increased productivity at Nanchang, Jiangxi Province, by Xiamen Tungsten Co. Ltd. and other smaller producers in Hunnan Province (table 24).

Industrial Minerals

Diamond.—The region's production of diamond accounted for more than one-quarter of the world total in 2003. Australia, which was the world's second ranked producer of diamond, accounted for 26% of the world total. The Argyle Mine, which is located in the Ellendale diamond province of the western Kimberley region in Western Australia, was Australia's largest and the world's leading productive diamond mine. Diamond produced from the Argyle Mine by Rio Tinto Ltd. accounted for about 20% of the world total in 2003. Another diamond mine operated by Rio Tinto was at the Merlin Mine in the Northern Trough in the Northern Territory of Australia. Regional production of diamond was expected to stay in a narrow range of between 28 million and 31 million carats per year after reaching a peak level of 42 million carats in 1995 (table 27).

Phosphate Rock.—The region's production of phosphate rock, in terms of its phosphorus pentoxide (P_2O_5) nutrient content, accounted for about 20% of the world total in 2003. China was the world's second ranked producer of phosphate rock after the United States. Other important producers were Australia and India. Most of the region's production of phosphate rock was consumed within the region.

China was the world's leading consumer of phosphate rock. The country's demand for phosphate rock was expected to increase substantially in the next 5 years.

Regional phosphate rock production was expected to increase at an average annual rate of about 1%, which would lead to a shortage in the regional supply because the regional growth in demand for phosphate rock was predicted to grow at a much higher rate than 1% per year during the next 5 to 6 years (table 28).

Mineral Fuels

Coal.—The region's overall production of coal, which included anthracite, bituminous, and lignite, accounted for about 55% the world total in 2003. Production of anthracite coal, however, accounted for about 96% of the world total; production of bituminous coal accounted for about 61%; and production of lignite accounted for about 19%. China, which was by far the world's leading producer of anthracite and bituminous coals, accounted for about 82% and 39%, respectively, of the world total. In Asia and the Pacific, North Korea and Vietnam were the other significant producers of anthracite coal; Australia, India, and Indonesia were the other important producers of bituminous coal and lignite (table 4).

Japan was the world's leading importer and consumer of coal; virtually all its coal for its iron and steel and utility industries was imported. In 2003, the country imported more than 167 Mt of coal, of which 108 Mt was bituminous (steam); 54 Mt, metallurgical-grade bituminous (coking); and 5 Mt, anthracite. Australia ranked as the world's leading coal exporter. The major regional exporters (suppliers) of coking coal were Australia and China; those of steam coal, Australia, China, and Indonesia; and those of anthracite, China and Vietnam.

Regional overall coal production was expected to increase at an average annual rate of about 5% between 2003 and 2009. This prediction was based on capacity expansions at the Hail Creek coking coal deposit in the northern Bowen Basin of central Queensland, Australis, by Rio Tinto; at the Shoushan coal mine in Henan Province, China, by Pingabo Coal Co.; at major coal mines in Shaanxi Province and the Nei Mongol and the Ningxia Autonomous Regions, China, by Shenhua Coal Corp.; and at six major coal mines in the Province of Quang Ninh, Vietnam, by Vietnam National Coal Corporation (table 29).

Natural Gas and Petroleum.—Asia and the Pacific lacks sufficient resources of natural gas and petroleum to meet the rapid regional growth in demand for hydrocarbons. The region's production of natural gas and crude petroleum accounted for about 11% and 10%, respectively, of the world total production in 2003 (table 4). Indonesia was the region's leading producer of natural gas; it was followed by Malaysia, Australia, and China. China was the leading producer of crude petroleum and was followed by Indonesia, Malaysia, and India. Australia, Brunei, Indonesia, and Malaysia were the major exporters of natural gas in the form of liquefied natural gas. Brunei, Indonesia, Malaysia, and Vietnam were the major exporters of crude petroleum.

Japan was the world's leading importer and consumer of natural gas and crude petroleum; about 80.2 billion cubic meters of natural gas and 1.6 billion barrels of crude petroleum were imported in 2003. Other important consumers of natural gas and crude petroleum in the region were China, India, the Republic of Korea, Thailand, and Taiwan. Australia, Indonesia, Malaysia, and Brunei were the major region's suppliers of natural gas and crude petroleum to Japan, the Republic of Korea, Singapore, and Taiwan.

Regional production of natural gas was expected to increase at an average annual rate of about 2% between 2003 and 2009. This prediction was based on gradual capacity expansions at Arun, Aceh Special Region, by ExxonMobil Oil Indonesia and offshore East Kalimantan by Total Indonesia and HUFFCO Group in Indonesia; offshore Sarawak, Malaysia, by Sarawak Shell Bhd.; and in Sichuan Province, by China National Petroleum Corp. (table 30). China will likely to become one of the world's leading importers and consumers of natural gas during the next 5 to 10 years. The Chinese Government projected that demand for natural gas would be 63 billion cubic meters in 2005 and could reach 97 billion cubic meters by 2010.

Regional production of crude petroleum was expected to increase at an average annual rate of 2% between 2003 and 2009. This prediction was based on gradual capacity expansions at Duri, Mina, and other major oilfields in central Sumatra by PT Caltex Pacific Indonesia and several major oilfields offshore East Kalimantan in Indonesia; at Liaohe, Liaoning Province, by Liaohe Bureau; in Bohai by Bohai Offshore Oil Corp.; and offshore Nanhai (South Sea) by Nanhai East Corp. in China (table 31). Because of rapid growth in demand for crude petroleum, China's crude petroleum imports increased by 15% to 69 Mt in 2002 and by 32% to 91 Mt in 2003 and were expected to increase by 32% to 120 Mt in 2004. China may overtake Japan as the region's leading importer of crude petroleum in 2004.

Uranium.—The region's uranium resources were mainly in Australia, which ranked first in known recoverable resources of uranium in the world and accounted for 28% of the world total. The country, which ranked second after Canada in the production of mined uranium, accounted for 22% of the world total in 2003. In Australia, three active mines were operated, and two more were under development. China was thought to produce about 1,000 t/yr of mined uranium in 2003, and production was expected to increase gradually to 1,500 t/yr by 2009. Most mined uranium was enriched and consumed domestically in China.

Australia exported most of its mined uranium in the form of uranium oxide (U_3O_8) to Japan and the Republic of Korea within the region and to France, Spain, Sweden, the United Kingdom, and the United States.

Regional production of mined uranium was expected to increase at an average annual rate of about 2% between 2003 and 2009. This prediction was based mainly on capacity expansions at the Olympic Dam Mine by WMC Resources Ltd. and two in situ leach operations at Beverly by Heathgate Resources Pty. Ltd. and at Honeymoon by Southern Cross Resources Inc. in South Australia (table 32).

Environment

In response to the call made by the Government for a lead-free Brunei, Brunei Shell Petroleum Co. Sdn. Bhd., which was a major producer of oil and gas, shipped surplus lead compound and sludge taken from two tetra-ethyl-lead storage vessels that had been demolished at its Seria Oil Refinery to the United Kingdom. The surplus lead compound and sludge, which had been classified as hazardous waste, needed recovery, treatment, and disposal in a safe and environmentally approved manner.

In Japan following enactment of the Home Appliance Recycling Law, Matsushita Electric Industrial Co. Ltd., which was the country's leading producer of consumer electronics and electric products, built a $43 million advanced recycling plant with four disassembly lines in Yashior, Hyogo Prefecture. The recycling plant wass capable of handling 1 million units per year of discarded household appliances.

To reclaim tin mining land in Malaysia, a pilot program was launched by the Forest Research Institute of Malaysia at the 121.4-hectare tin mine site in Bidor, State of Perak. The purpose of the program was to change the condition of the soil by adding fertilizer and nutrients and to plant 13 species of trees that have a high commercial value. The pilot program was funded by the Malaysian Government and the ASEAN—Korea Environmental Cooperation.

In Thailand, the adverse environmental impact of the proposed potash mining project in the Province of Udon Thani was again a major environmental issue in 2003. A six-member panel, which was named by the Ministry of Natural Resources and Environment, completed its review of the project's environmental impact assessment (EIA) report submitted by Asia Pacific Resources Ltd. and found that it failed to establish a level of operation to minimize the negative effects on nearby villagers and to alleviate the negative impact of potash tailings, which would be made up mainly of salt, on villagers' household equipment. As a result, a revised EIA was prepared and submitted by Asian Pacific Resources in 2003.

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TABLE 1
ASIA AND THE PACIFIC: AREA AND POPULATION IN 2003

Country	Area[1] total (square kilometers)	Population[2] total (thousands)
Afghanistan	647,500	28,766
Australia	7,687,850	19,890
Bangladesh	144,000	138,066
Bhutan	47,000	874
Brunei	5,770	356
Burma	678,500	49,362
Cambodia	181,040	13,404
China	9,596,960	1,288,400
Fiji	18,270	835
Hong Kong	1,092	6,816
India	3,287,590	1,064,399
Indonesia	1,919,440	214,471
Japan	377,835	127,210
Korea, North	120,540	22,612
Korea, Republic of	98,480	47,912
Laos	236,800	5,660
Malaysia	329,750	24,774
Mongolia	1,565,000	2,480
Nepal	140,800	24,660
New Caledonia	19,060	225
New Zealand	268,680	3,870
Pakistan	803,940	148,439
Papua New Guinea	462,840	5,502
The Philippines	300,000	81,503
Singapore	692	4,250
Solomon Islands	28,450	457
Sri Lanka	65,610	19,193
Taiwan	35,980	22,605
Thailand	514,000	62,014
Timor, East	15,007	810
Vietnam	329,560	81,314
Total		3,511,129
World total		6,271,698

[1] Source: Central Intelligence Agency World Factbook 2004.

[2] Source: World Bank 2004, World Development Indicators Database, September.

TABLE 2
ASIA AND THE PACIFIC: ECONOMY IN 2003[1,2]

Country	Gross domestic product based on purchasing power parity Total (million dollars)	Per capita (dollars)	Real gross domestic product growth rate (percentage) 2002	2003	2006
Afghanistan[3]	20,000	700	NA	NA	9.7
Australia	579,662	29,143	3.6	3.0	3.3
Bangladesh	246,526	1,786	4.9	5.4	5.9
Bhutan	1,847	2,113	7.7	6.5	11.5
Brunei	5,522	15,511	3.0	3.6	1.3
Burma	74,978	1,519	5.5	0.0	3.5
Cambodia	29,344	2,189	5.5	5.2	4.3
China	6,435,838	4,995	8.0	9.1	8.0
Fiji	4,607	5,517	4.4	5.2	2.3
Hong Kong	191,031	28,027	2.3	3.2	4.0
India	3,096,239	2,909	4.7	7.2	6.4
Indonesia	721,583	3,364	3.7	4.1	6.0
Japan	3,582,515	28,162	0.2	2.5	1.9
Korea, North[3,4]	29,580	1,308	1.2	1.8	NA
Korea, Republic of	858,028	17,908	6.3	3.1	5.2
Laos	10,734	1,896	5.9	5.3	6.5
Malaysia	240,210	9,696	4.1	5.3	6.2
Mongolia	4,470	1,802	3.9	5.3	NA
Nepal	34,964	1,418	-0.5	3.1	5.0
New Caledonia[5]	4,670	20,756	NA	NA	NA
New Zealand	84,898	21,937	4.4	3.4	2.6
Pakistan	292,641	1,971	4.4	6.2	6.3
Papua New Guinea	13,783	2,505	-3.3	2.7	2.3
The Philippines	352,179	4,321	4.4	4.7	4.5
Singapore	104,042	24,480	2.2	1.1	4.5
Solomon Islands	749	1,639	-2	5.1	5.2
Sri Lanka	72,482	3,776	4.0	5.9	6.0
Taiwan	537,393	23,773	3.5	3.3	4.3
Thailand	470,086	7,580	5.3	6.8	6.2
Timor, East	440	543	3.0	-2.7	2.3
Vietnam	202,462	2,490	5.8	6.0	7.0
Total	18,303,503	XX	XX	XX	XX
World total	51,656,251	XX	XX	XX	XX

NA Not available. XX Not applicable.

[1] Includes data as of January 1, 2004. Gross domestic product listed may differ from that reported in individual country owing to differences in source or date of reporting.

[2] Source: International Monetary Fund, World Economic Outlook Database, September 2004.

[3] Source: Central Intelligence Agency World Factbook 2004.

[4] Source: Bank of Korea, Gross Domestic Product of North Korea in 2003.

[5] Source: World Bank, World Development Indicators Database, September 2004.

TABLE 3
ASIA AND THE PACIFIC: SELECTED EXPLORATION SITES IN 2003[1]

Country	Type[2]	Site	Commodity	Company	Resources[3]	Exploration[4]
Australia	F	Bowdens	Ag, Pb, Zn	Silver Standard Resources Inc.	79 Moz Ag, 157,000 t Pb, 215,000 t Zn	Feasibility drilling.
Do.	F	Cowal	Au	Barrick Gold Corp.	2.5 Moz Au	Do.
Do.	E	Tomingley/Wyoming	Au	Alkane Exploration NL	439,000 oz Au	Extensive drilling.
Do.	E	Erye Peninsula/Barns	Au	Adelaide Resources Ltd.	Data not released.	Do.
Do.	P	Bronzewing South	Au	AuDax Resources Ltd.	do.	Do.
Do.	P	Minjar	Au	Gindalbie Gold NL	212,000 oz Au	Do.
Do.	F	Mt. Gibson	Au	Oroya Mining Ltd.	749,000 oz Au	Feasibility drilling.
Do.	P	St. Ives	Au	Gold Fields Ltd.	4.28 Moz Au	Do.
Do.	P	Sunrise Dam	Au	AngloGold Ltd.	4.59 Moz Au	Extensive work program.
Do.	P	Woodie Woodie	Mn	Consolidated Minerals Ltd.	Data not released	Extensive drilling.
China	E	Boka	Au	Southwestern Resources Corp.	do.	Do.
Do.	F	Jinfeng	Au	Sino Gold Ltd.	2.6 Moz Au	Do.
Laos	P	Sepon Gold	Au, Ag	Oxiana Resources NL	4 Moz Au, 7 Moz Ag	Do.
Mongolia	E	Oyu Tolgai	Cu, Au	Ivanhoe Mines Ltd.	14 Mt Cu, 6.4 Moz Au	Do.
Pakistan	E	Reko Diq	Cu, Au	Tethyan Copper Company Ltd.	577,000 t Cu	Extensive work program.
Philippines	E	Boyongan	Cu, Au	Anglo American Exploration B.V.	1.1 Mt Cu, 5.1 Moz Au	Extensive drilling.
Do.	E	Tampakan	Cu, Au	Indophil Resources NL	6.7 Mt Cu, 8.6 Moz Au	Do.
Thailand	P	Chatree/Prospect A	Au, Ag	Kingsgate Consolidated Ltd.	1.6 Moz Au, 11 Moz Ag	Do.

[1] Abbreviations used for commodities in this table include the following: Ag-silver; Au-gold; Cu-copper, Mn-manganese; Pb-lead; Zn-zinc. Abbreviations used for units of measure include the following: Moz-million troy ounces; Mt-million metric tons; oz-troy ounces; t-metric tons.

[2] E-Active exploration; F-Feasibility work ongoing/completed; P-Exploration at producing site.

[3] Resources reported where available based on data from various sources and reflect unverified public information reported by trade journals.

[4] Sites where extensive (greater than 10,000 meters) drilling or significant (more than US$5 million) expenditure have been reported.

TABLE 4
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2003[1]

(Thousand metric tons unless otherwise specified)

	Metals										
	Aluminum			Copper		Gold, mine output, Au content (kilograms)	Iron and steel				Lead, mine output, Pb content (metric tons)
							Iron				
							Ore				
Country	Alumina	Bauxite	Metal[2]	Mine output, Cu content	Refined, primary		Gross weight	Fe content	Pig	Steel, crude	
Afghanistan	--	--	--	5	--	--	--	--	--	--	--
Australia	16,529	55,602	1,984	830	484	282,000	187,219	116,355	9,660	9,660	688,000
Bangladesh[e]	--	--	--	--	--	--	--	--	--	25	--
Bhutan	--	--	--	--	--	--	--	--	--	--	--
Brunei	--	--	--	--	--	--	--	--	--	--	--
Burma[e]	--	--	--	28	28	100	--	--	2	25	500
Cambodia	--	--	--	--	--	--	--	--	--	--	--
China[e]	6,110	13,000	5,970	610	1,420	205,000	261,000	83,000	213,670 [3]	222,340 [3]	955,000
Christmas Island	--	--	--	--	--	--	--	--	--	--	--
Fiji	--	--	--	--	--	3,250	--	--	--	--	--
Hong Kong	--	--	--	--	--	--	--	--	--	--	--
India[e]	2,500	10,002 [3]	798 [3]	28 [3]	394	3,100 [3]	85,000	54,400	24,000	31,779 [3]	33,100
Indonesia	--	1,094	180 [e]	979	223	141,000	245	140	1,230	2,040 [e]	--
Japan	330 [e]	-- [e]	1,250	--	1,252	8,143	1 [e]	(4) [e]	82,091	110,511	5,660
Korea, North[e]	--	--	--	13	14	2,000	4,430	1,260	900	1,090	60,000
Korea, Republic of	--	--	--	--	510	207	365	161	27,314	46,310	--
Laos[e]	--	--	--	--	--	5,140	--	--	--	--	--
Malaysia	--	6	--	--	--	4,739	597	383	--	4,700 [e]	--
Mongolia	--	--	--	130	2	11,100	--	--	--	16	--
Nauru	--	--	--	--	--	--	--	--	--	--	--
Nepal	--	--	--	--	--	--	--	--	--	--	--
New Caledonia	--	--	--	--	--	--	--	--	--	--	--
New Zealand[e]	--	--	356 [3]	--	--	9,305	--	--	600	800	--
Pakistan[e]	--	10	--	--	--	--	--	--	1,600	550	--
Papua New Guinea[e]	--	--	--	204	--	70,000	--	--	--	--	--
Philippines	--	--	--	20	171	37,840	--	--	--	550 [e]	--
Singapore	--	--	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--	--	--
Sri Lanka	--	--	--	--	--	--	--	--	--	--	--
Taiwan	--	--	--	--	--	--	--	--	10,779	18,563	--
Thailand	--	--	--	--	--	4,269	10	5	--	3,572	--
Vietnam[e]	--	--	--	--	--	2,000	--	--	--	544	1,100
Total	25,500	79,700	10,500	2,850	4,500	789,000	539,000	256,000	372,000	453,000	1,740,000
Share of 2003 world total	46.0%	54.3%	31.5%	20.8%	32.6%	31.0%	46.2%	39.7%	58.3%	48.6%	53.5%
Share of 2002 world total	45.9%	53.5%	28.5%	22.4%	30.6%	30.0%	46.0%	40.1%	56.1%	46.5%	47.9%
United States	4,380	NA	2,700	1,120	1,250	277,000	46,400	29,300	40,600	93,700	460,000
World total	55,400	147,000	33,400	13,700	13,800	2,540,000	1,170,000	644,000	638,000	932,000	3,260,000

See footnotes at end of table.

TABLE 4--Continued
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2003[1]

(Thousand metric tons unless otherwise specified)

	Metals									
				Nickel		Tin, metric tons			Zinc, metric tons	
Country	Lead, refined, primary (metric tons)	Manganese ore, mine output, Mn content	Mercury, mine output, Hg content (metric tons)	Mine output, Ni content	Refined	Mine output, Sn content	Metal, primary	Tungsten, mine output, W content (metric tons)	Mine output, Zn content	Metal[2]
Afghanistan	--	--	--	--	--	--	--	--	--	--
Australia	270,000	1,247	--	179	209	3,819	597	--	1,479,000	557,500
Bangladesh[e]	--	--	--	--	--	--	--	--	--	--
Bhutan	--	--	--	--	--	--	--	--	--	--
Brunei	--	--	--	--	--	--	--	--	--	--
Burma[e]	1,000	(4)	--	(4)	--	210	30	30	500	--
Cambodia	--	--	--	--	--	--	--	--	--	--
China[e]	1,290,000	920	610	61	65	102,000	98,000	50,000	2,030,000	2,320,000
Christmas Island	--	--	--	--	--	--	--	--	--	--
Fiji	--	--	--	--	--	--	--	--	--	--
Hong Kong	--	--	--	--	--	--	--	--	--	--
India[e]	61,500	620	--	--	--	--	--	--	162,000	278,000
Indonesia	--	--	--	143	--	70,000[e]	65,000[e]	--	--	--
Japan	105,460	--	--	--	35	--	662	--	44,574	686,115
Korea, North[e]	75,000	--	--	--	--	--	--	600	100,000	100,000
Korea, Republic of	169,297	--	--	--	31	--	--	--	--	644,218
Laos	--	--	--	--	--	360[e]	--	--	1,000[e]	--
Malaysia	--	--	--	--	--	3,359	18,250	--	--	--
Mongolia	--	--	--	--	--	--	--	40	--	--
Nauru	--	--	--	--	--	--	--	--	--	--
Nepal	--	--	--	--	--	--	--	--	--	--
New Caledonia	--	--	--	112	--	--	--	--	--	--
New Zealand[e]	--	--	--	--	--	--	--	--	--	--
Pakistan[e]	--	--	--	--	--	--	--	--	--	--
Papua New Guinea[e]	--	--	--	--	--	--	--	--	--	--
Philippines	--	--	--	27	--	--	--	--	--	--
Singapore	--	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--	--
Sri Lanka	--	--	--	--	--	--	--	--	--	--
Taiwan	--	--	--	--	11[e]	--	--	--	--	--
Thailand	2,000	--	--	--	--	793	15,763	208[e]	37,100[e]	69,600
Vietnam[e]	--	--	--	--	--	4,600	1,300	--	12,000	--
Total	1,970,000	2,790	610	522	351	185,000	200,000	50,900	3,870,000	4,660,000
Share of 2003 world total	57.0%	30.8%	52.3%	39.2%	39.2%	71.3%	74.3%	87.6%	41.1%	47.2%
Share of 2002 world total	51.3%	30.2%	52.3%	36.6%	32.2%	70.0%	75.5%	88.2%	38.0%	45.3%
United States	245,000	--	NA	--	--	--	--	--	738,000	303,000
World total	3,460,000	9,040	1,170	1,330	895	259,000	269,000	58,100	9,400,000	9,850,000

See footnotes at end of table.

TABLE 4--Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2003[1]

(Thousand metric tons unless otherwise specified)

									Mineral fuels		
		Industrial minerals								Natural gas, marketed/ dry (million cubic meters)[5]	Petroleum, crude (thousand 42-gallon barrels)
Country	Cement hydraulic	Fluorspar (metric tons)	Graphite (metric tons)	Magnesite	Mica (metric tons)	Salt	Anthracite	Coal Bituminous	Lignite		
Afghanistan	120	--	--	--	--	13	--	185	--	2,500	--
Australia	8,000 [e]	--	--	473	--	10,400	--	357,790	67,000	30,000 [e]	250,000 [e]
Bangladesh[e]	5,000	--	--	--	--	350 [e]	--	--	--	7,300	1,800
Bhutan	160 [e]	--	--	--	--	--	--	66 [e]	-- [e]	--	--
Brunei	235	--	--	--	--	--	--	--	--	12,024	75,642
Burma[e]	600	--	--	--	--	35 [e]	--	--	57	8,500	5,000
Cambodia	--	--	--	--	--	50 [e]	--	--	--	--	--
China[e]	862,080 [3]	2,650,000	710,000	3,700	--	34,377 [3]	218,000	1,470,000	52,000	28,000	1,260,000
Christmas Island	--	--	--	--	--	--	--	--	--	--	--
Fiji	100 [e]	--	--	--	--	--	--	--	--	--	--
Hong Kong	--	--	--	--	--	--	--	--	--	--	--
India[e]	100,000	4,200	110,000	380	3,600	15,000 [3]	--	328,000	25,000	25,000	241,000
Indonesia	35,500 [e]	--	--	--	--	680 [e]	50	114,000	--	54,000	413,000
Japan	68,766	--	--	--	--	1,263	--	1,400 [e]	-- [e]	3,011	5,161
Korea, North	5,540	25,000	25,000	1,000	--	500	16,000	--	6,300	--	--
Korea, Republic of	59,199	--	58	--	33,645	800	3,298	--	--	--	--
Laos	250 [e]	--	--	--	--	5	--	230 [e]	-- [e]	--	--
Malaysia	17,243	--	--	--	3,609	--	--	173	--	51,813	269,370
Mongolia	150	275,000	--	--	--	1	--	5,900	--	--	150
Nauru	--	--	--	--	--	--	--	--	--	--	--
Nepal	295 [e]	--	--	--	--	5	--	10	--	--	--
New Caledonia	100	--	--	--	--	--	--	--	--	--	--
New Zealand[e]	950	--	--	--	--	70	724 [3]	4,173 [3]	283 [3]	5,000	8,711
Pakistan[e]	10,300	1,000	--	5	--	1,723	--	3,800	--	22,000	24,000
Papua New Guinea[e]	--	--	--	--	--	--	--	--	--	1,450	20,000
Philippines	8,500 [e]	--	--	--	--	429 [e]	--	2,025	4	--	2,000
Singapore	--	--	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--	--	--
Sri Lanka	1,164	--	3,387	--	1,174	79	--	--	--	--	--
Taiwan	18,474	--	--	--	3,237	(4)	--	--	--	760	288
Thailand	32,530	2,368	--	--	--	892	--	--	18,830	21,767	35,158
Vietnam	23,282	3,000	--	--	--	800	18,963	--	--	3,450	125,281
Total	1,260,000	2,960,000	848,000	5,560	45,300	67,500	257,000	2,290,000	169,000	277,000	2,740,000
Share of 2003 world total	64.0%	58.1%	55.1%	41.7%	16.5%	30.9%	96.4%	60.5%	18.7%	10.6%	10.2%
Share of 2002 world total	61.5%	56.7%	52.7%	41.1%	16.2%	32.4%	87.9%	52.6%	19.0%	10.3%	10.7%
United States	94,329	--	--	W	78,600	43,700	1,070	892,000	78,400	567,000	2,070,000
World total	1,970,000	5,100,000	1,540,000	13,300	275,000	219,000	267,000	3,780,000	906,000	2,620,000	26,800,000

See footnotes at end of table.

TABLE 4--Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2003[1]

[e] Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in world total. -- Zero or zero percent.

[1] Totals may not add owing to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of April 2005.

[2] Primary and secondary production.

[3] Reported figure.

[4] Less than 1/2 unit.

[5] Data not found on country table is based on the following source: Energy Information Administration, International Energy Annual 2002, World Natural Gas Production 2001 Table 4.1

TABLE 5
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 1990-2009[1]

(Thousand metric tons, gross weght)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	41,400	42,700	53,800	55,600	55,000	57,000	60,000
China	2,400	5,000	9,000	13,000	16,000	20,000	22,000
India	4,850	5,240	7,560	10,000	11,000	12,000	13,000
Indonesia	1,210	899	1,150	1,094	1,200	1,200	1,400
Malaysia	398	184	123	6	6	--	--
Other	403	190	131	74	74	74	74
Total	50,700	54,200	71,800	79,800	83,300	90,000	96,000

[e] Estimated. -- Negligible or no production.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 6
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PRIMARY ALUMINUM METAL PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2,003	2005[e]	2007[e]	2009[e]
Australia	1,230	1,300	1,770	1,860	2,000	2,200	2,500
China	847	1,750	2,800	5,700	6,600	7,000	7,500
India	433	537	644	798	830	860	890
Indonesia	186	220	160	180	220	220	220
New Zealand	260	273	328	350	350	350	350
Other	34	18	7	7	410	410	610
Total	2,990	4,100	5,710	8,900	10,400	11,000	12,100

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 7
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SECONDARY ALUMINUM METAL PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
China	7	12	175	270	330	350	400
Japan	1,100	1,200	1,210	1,200	1,000	1,000	1,000
Other	100	100	100	100	100	100	100
Total	1,210	1,310	1,490	1,570	1,400	1,450	1,500

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 8
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 1990-2009[1]

(Metal content in thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	327	398	829	830	910	910	1,000
China	285	445	593	610	640	650	660
India	58	47	32	28	28	26	26
Indonesia	164	444	1,010	979	1,200	1,250	1,260
Mongolia	124	122	125	130	130	130	180
Papua New Guinea	170	213	203	200	210	210	200
Other	239	152	171	60	150	210	310
Total	1,370	1,820	2,960	2,840	3,270	3,390	3,600

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 9
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	274	248	488	484	650	650	700
China	560	1,080	1,370	1,850	2,300	2,600	2,800
India	42	40	243	394	440	480	520
Indonesia	--	--	158	224	240	240	240
Japan	1,010	1,190	1,440	1,430	1,450	1,540	1,600
Korea, Republic of	186	235	468	510	510	530	530
Other	160	185	180	180	350	400	500
Total	2,230	2,980	4,350	5,070	5,940	6,440	6,900

[e] Estimated. -- Negligible or no production.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 10
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 1990-2009[1]

(Metal content in kilograms)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	244,000	254,000	269,000	282,000	270,000	270,000	300,000
China	100,000	140,000	180,000	205,000	210,000	215,000	220,000
Indonesia	11,200	64,000	125,000	141,000	185,000	195,000	200,000
Japan	7,300	9,190	8,400	8,140	8,200	8,200	8,200
Mongolia	1,000	4,500	11,800	11,100	13,000	16,000	18,000
New Zealand	4,630	12,100	9,880	10,000	11,000	11,000	12,000
Papua New Guinea	31,900	51,700	74,500	70,000	71,000	72,000	74,000
Philippines	24,600	27,000	36,500	35,000	35,000	36,000	38,000
Other	9,940	19,000	16,300	21,400	23,000	23,500	25,000
Total	435,000	581,000	731,000	784,000	830,000	850,000	900,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 11
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED IRON ORE MINE PRODUCTION, 1990-2009[1]

(Metal content in thousand metric tons)

Country	Average ore grade (% Fe)	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	62	69,800	88,700	107,000	116,000	140,000	147,000	160,000
China	33	55,000	82,300	73,600	86,000	92,000	92,000	92,500
India	64	34,400	41,700	48,600	54,400	56,000	57,000	58,000
Korea, North	30	4,700	2,000	1,100	1,300	1,500	1,500	1,500
Other		1,300	1,300	1,300	1,500	1,600	1,600	1,600
Total		165,000	216,000	232,000	259,000	291,000	299,000	314,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 12
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED DIRECT-REDUCED IRON AND PIG IRON PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	6,130	7,860	6,110	9,660	10,000	10,000	10,000
China	62,400	105,000	131,000	202,300	230,000	260,000	280,000
India	13,400	22,900	26,800	29,800	30,000	31,000	32,000
Japan	80,200	74,900	81,070	82,100	82,500	82,000	82,000
Korea, Republic of	15,300	22,300	24,900	27,500	28,000	28,000	28,000
Taiwan	5,470	6,060	9,970	10,500	10,500	11,000	11,500
Other	2,000	2,400	4,000	4,000	4,100	4,200	4,200
Total	185,000	241,000	284,000	366,000	395,000	430,000	450,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 13
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	6,670	8,450	7,300	9,660	10,000	10,000	10,000
China	66,100	95,400	129,000	220,000	260,000	280,000	300,000
India	15,000	22,800	26,900	31,800	32,000	34,000	36,000
Japan	110,000	102,000	106,000	111,000	110,000	110,000	100,000
Korea, Republic of	23,100	36,800	43,100	46,300	48,000	49,000	50,000
Malaysia	1,200	2,450	2,430	4,700	4,700	4,500	5,000
Taiwan	9,750	11,600	17,300	18,500	19,000	19,500	20,000
Thailand	685	2,134	2,100	3,570	3,600	3,600	4,000
Other	19,000	15,000	14,500	14,200	15,200	16,000	29,000
Total	252,000	297,000	349,000	460,000	500,000	530,000	550,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 14
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED LEAD MINE PRODUCTION, 1990-2009[1]

(Metal content in metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	570,000	455,000	739,000	688,000	716,000	716,000	718,000
China	315,000	520,000	660,000	955,000	960,000	1,000,000	1,000,000
India	23,200	34,000	28,900	33,100	34,000	35,000	36,000
Japan	18,700	9,660	8,840	5,700	5,500	5,000	5,000
Korea, North	80,000	75,000	60,000	60,000	60,000	60,000	60,000
Vietnam	--	1,000	1,000	1,000	1,000	1,000	1,000
Other	44,000	17,000	21,000	3,000	3,000	3,000	3,000
Total	1,050,000	1,110,000	1,520,000	1,750,000	1,780,000	1,800,000	1,800,000

[e] Estimated. -- Negligible or no production.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 15

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PRIMARY REFINED LEAD PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	212	215	223	270	240	240	250
China	260	458	998	1,290	1,350	1,400	1,500
India	29	62	57	62	62	64	64
Japan	205	148	130	105	100	100	100
Korea, North	70	65	60	60	60	60	60
Korea, Republic of	61	130	171	170	170	170	170
Other	7	10	4	2	2	2	2
Total	844	1,090	1,640	1,960	1,980	2,050	2,150

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 16

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SECONDARY REFINED LEAD PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	17	26	28	40	40	40	40
China	36	150	102	290	300	320	340
India	17	28	21	25	25	24	24
Japan	122	140	182	190	195	195	200
Malaysia	16	34	35	42	42	42	42
Philippines	12	17	16	16	16	16	17
Thailand	11	11	24	23	23	23	23
Other	24	34	37	37	37	55	55
Total	255	440	445	663	680	715	740

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 17

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 1990-2009[1]

(Metal content in metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	67,800	103,000	167,000	179,000	220,000	230,000	250,000
China	33,000	41,800	50,300	61,000	63,000	66,000	67,000
Indonesia	68,300	88,200	98,200	143,000	160,000	160,000	180,000
New Caledonia	85,100	120,000	123,000	122,000	124,000	125,000	150,000
Philippines	15,800	15,100	17,400	29,000	29,000	30,000	32,000
Total	270,000	368,000	456,000	534,000	596,000	610,000	680,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 18

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 1990-2009[1]

(Metal content in kilograms)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	100	100	171	225	230	230	230
China	260	300	650	750	790	850	900
Total	360	400	821	975	1,020	1,080	1,130

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 19

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 1990-2009[1]

(Metal content in kilograms)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	400	400	812	820	950	950	1,000
China	130	170	350	430	470	500	550
Total	530	570	1,160	1,250	1,420	1,450	1,550

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 20

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SILVER MINE PRODUCTION, 1990-2009[1]

(Metal content in metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	1,170	939	2,060	1,870	2,400	2,500	2,750
China	130	910	1,600	2,400	2,800	2,800	2,900
India	33	38	40	54	54	55	55
Indonesia	107	276	256	163	400	410	410
Japan	150	100	104	79	80	80	80
New Zealand	5	28	23	24	25	25	30
Papua New Guinea	115	65	79	71	71	72	75
Philippines	47	27	24	35	35	36	38
Other	40	18	29	32	33	35	40
Total	1,800	2,400	4,220	4,730	5,900	6,000	6,400

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 21

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED TIN MINE PRODUCTION, 1990-2009[1]

(Metal content in metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	7,380	8,660	9,150	3,820	5,000	5,000	5,000
China	42,000	61,900	99,400	102,000	110,000	110,000	110,000
Indonesia	30,200	46,100	51,600	70,000	62,000	64,000	65,000
Malaysia	28,500	6,400	6,310	3,400	3,600	3,600	3,600
Thailand	14,600	2,200	1,930	800	900	900	900
Vietnam	850	4,500	4,100	4,600	4,500	4,500	4,500
Other	400	300	500	500	500	500	500
Total	124,000	130,000	173,000	185,000	187,000	189,000	190,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 22

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED REFINED TIN PRODUCTION, 1990-2009[1]

(Metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	512	870	1,030	997	1,500	1,500	1,500
China	35,000	67,700	112,000	98,000	100,000	100,000	105,000
Indonesia	30,400	38,600	46,400	65,000	66,000	70,000	72,000
Japan	816	630	593	660	650	650	650
Malaysia	49,100	39,400	26,200	18,300	32,000	32,000	32,000
Thailand	15,500	8,240	17,100	16,000	18,000	18,000	18,000
Vietnam	1,800	2,400	1,800	1,300	1,400	1,400	1,400
Total	133,000	158,000	205,000	200,000	220,000	224,000	231,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 23
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED ILMENITE MINE PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	1,620	1,980	2,150	2,000	3,000	3,000	4,000
China	150	150	250	800	850	850	900
India	280	290	380	500	480	480	460
Malaysia	530	152	125	95	100	100	120
Vietnam	--	--	174	200	230	230	250
Other	100	90	90	90	90	90	90
Total	2,680	2,660	3,170	3,690	4,800	4,800	5,800

[e] Estimated. -- Negligible or no production.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 24
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED TUNGSTEN MINE PRODUCTION, 1990-2009[1]

(Metal content in metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
China	32,000	27,400	37,000	50,000	52,000	53,000	53,000
Korea, North	1,000	900	500	600	600	600	600
Other	4,000	670	160	100	100	100	100
Total	37,000	29,000	37,700	50,700	52,700	53,700	53,700

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 25
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED ZINC MINE PRODUCTION, 1990-2009[1]

(Metal content in thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	933	937	1,420	1,480	1,600	1,600	1,800
China	619	1,010	1,780	2,030	2,200	2,300	2,500
India	74	155	144	162	164	166	168
Japan	127	95	64	45	43	43	40
Korea, North	230	150	100	100	100	100	100
Thailand	11	23	27	37	37	35	35
Other	34	22	34	42	41	40	40
Total	2,030	2,390	3,570	3,900	4,190	4,300	4,700

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 26
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED ZINC METAL PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	303	320	490	553	565	600	700
China	550	1,080	1,980	2,300	2,500	2,600	2,800
India	79	171	201	278	280	282	284
Japan	732	711	699	686	690	690	700
Korea, Republic of	248	279	591	644	685	685	700
Thailand	63	56	101	114	110	110	120
Other	210	170	120	120	120	120	120
Total	2,190	2,790	4,180	4,700	4,950	5,100	5,400

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 27
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED DIAMOND PRODUCTION, 1990-2009[1]

(Thousand carats)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	34,600	40,700	26,600	31,100	27,500	28,000	30,000
China	1,000	1,130	1,150	1,200	1,250	1,300	1,300
India	15	21	16	18	16	20	22
Indonesia	23	22	23	23	23	23	23
Other	10	10	10	10	10	10	10
Total	35,600	41,900	27,800	32,400	28,800	29,400	31,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 28
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PHOSPHATE ROCK PRODUCTION, 1990-2009[1]

(P_2O_5 content in thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	--	1	225	545	550	550	600
China	6,400	7,960	5,820	7,550	7,700	7,700	7,800
India	181	360	336	350	360	360	360
Philippines	3	8	109	113	115	115	120
Vietnam	96	178	236	210	220	220	250
Other	562	510	510	300	250	220	200
Total	7,240	9,020	7,010	8,520	8,650	8,620	9,330

[e] Estimated. -- Negligible or no production.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 29
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 1990-2009[1]

(Thousand metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	199,000	194,000	313,000	325,000	350,000	352,000	355,000
China	1,010,000	1,310,000	957,000	1,740,000	2,100,000	2,250,000	2,400,000
India	226,000	290,000	335,000	353,000	360,000	370,000	380,000
Indonesia	10,000	40,000	77,200	114,000	120,000	130,000	140,000
Japan	7,980	6,260	3,130	1,400	1,400	--	--
Korea, North	68,000	70,000	22,500	22,300	26,000	26,000	26,000
Korea, Republic of	17,200	5,720	4,170	3,300	3,400	3,400	3,400
Philippines	1,190	1,200	1,300	1,600	1,600	1,700	1,700
Thailand	14,200	18,400	17,786	18,800	19,600	19,600	20,000
Vietnam	4,020	8,350	11,600	19,000	22,000	23,000	23,000
Other	311	382	663	880	890	950	950
Total	1,560,000	1,940,000	1,740,000	2,600,000	3,000,000	3,180,000	3,350,000

[e] Estimated. -- Negligible or no production.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 30
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED NATURAL GAS PRODUCTION, 1990-2009[1]

(Million cubic meters)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	20,700	29,700	30,800	30,000	32,000	35,000	40,000
Brunei	9,450	11,200	10,800	10,000	12,000	12,000	12,000
China	15,000	18,000	22,000	34,000	36,000	38,000	40,000
India	10,200	17,800	30,000	27,000	28,000	28,000	28,000
Indonesia	61,000	85,100	82,300	89,300	92,000	92,000	94,000
Malaysia	18,500	36,500	56,900	65,000	65,000	70,000	70,000
Thailand	7,210	11,400	20,200	21,800	22,000	22,000	25,000
Other	7,810	10,500	14,100	19,500	19,700	19,700	20,000
Total	150,000	220,000	267,000	297,000	307,000	317,000	329,000

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 31
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED CRUDE PETROLEUM PRODUCTION, 1990-2009[1]

(Million 42-gallon barrels)

Country	1990	1995	2,000	2003	2005[e]	2007[e]	2009[e]
Australia	211	185	264	250	230	230	240
China	1,010	1,100	1,200	1,260	1,300	1,400	1,400
India	250	258	238	241	242	245	247
Indonesia	534	580	516	413	450	460	490
Malaysia	227	257	249	260	260	260	260
Vietnam	20	64	115	125	160	170	170
Other	50	64	72	74	75	75	75
Total	2,300	2,510	2,650	2,620	2,720	2,850	2,900

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 32
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED URANIUM MINE PRODUCTION, 1990-2009[1]

(Metal content in metric tons)

Country	1990	1995	2000	2003	2005[e]	2007[e]	2009[e]
Australia	3,530	3,700	7,580	9,000	9,000	9,000	9,100
China	100	500	1,000	1,000	1,300	1,500	1,500
Other	50	50	50	50	50	50	50
Total	3,680	4,250	8,630	10,100	10,400	10,600	10,700

[e] Estimated.

[1] Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

THE MINERAL INDUSTRY OF AFGHANISTAN

By Travis Q. Lyday

The landlocked Islamic Republic of Afghanistan is an extremely poor country with rugged terrain and a seasonally harsh climate. It encompasses approximately 647,500 square kilometers. For almost one-quarter of a century, the country has endured extreme political upheaval, civil strife, and outright war, including U.S. military involvement since 2001. Most of the major administrative, agricultural, communication, education, Government, heavy- and small-scale industries, social services, and transportation systems were seriously damaged or utterly destroyed. An estimated 4 million to 5 million of the 29 million population was displaced within and outside the country. Additionally, natural catastrophes, such as drought and earthquakes, have afflicted the country in the past few years.

The country, however, has economic potential owing to mineral resources that range from exotic minerals, such as lapis lazuli and other fine gems for which Afghanistan has been an important source for many centuries, to more-standard ore deposits, such as copper, gold, and iron ore. Precious and semiprecious stone deposits are numerous. Some of the main gemstones that were produced in 2003 were aquamarine, emerald, kunzite, lapis lazuli, ruby, and tourmaline, most of which were exported to Pakistan. Additional mineral resources include barite, coal, chromite, lead, salt, sulfur, talc, and zinc, as well as natural gas and petroleum. Some of these resources were exploited in the past, and others were not. The country has limited resources under production and generally lacks the infrastructure to use them.

More-extensive coverage of the mineral industry of Afghanistan can be found in the 2002 U.S. Geological Survey Minerals Yearbook 2002, volume III, Area Reports—International—Asia and the Pacific.

TABLE 1
AFGHANISTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003
Barite		2,000	2,000	2,000	2,000	2,000
Cement, hydraulic		120,000	120,000	120,000	120,000	120,000
Coal, bituminous		190,000	190,000	190,000 r	185,000	185,000
Copper, mine output, Cu content		5,000	5,000	5,000	5,000	5,000
Gas, natural:						
Gross	million cubic meters	2,600 r	3,000	3,000	3,000	3,000
Marketed	do.	2,200 r	2,500	2,500	2,500	2,500
Gypsum		3,000	3,000	3,000	3,000	3,000
Natural gas liquids	thousand 42-gallon barrels	40 r	45	45	45	45
Nitrogen, N content of ammonia		5,000	5,000	5,000	5,000	5,000
Salt, rock		13,000	13,000	13,000	13,000	13,000

rRevised.

[1] Table includes data available through October 1, 2004.

[2] Estimated data are rounded to no more than three significant digits.

THE MINERAL INDUSTRY OF AUSTRALIA

By Travis Q. Lyday

Australia was one of the world's leading mineral-producing nations in 2003 owing to its large economic demonstrated resources (EDRs) of lead, nickel, mineral sands, tantalum, uranium, and zinc. EDRs, which are mineral resourses for which profitable extraction or production is possible at current prices, are equivalent to reserves (U.S. Bureau of Mines and U.S. Geological Survey, 1980). Additionally, Australia's level of EDRs was within the top 6 worldwide for 11 additional mineral commodities—bauxite, black coal, brown coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, and rare-earth oxides.

Australia's gross domestic product (GDP) grew at a rate of 3% in 2003 with purchasing power parity estimated to be $571.4 billion (U.S. Energy Information Administration, 2004§[1]). The mineral industry represented about 8.5% of the Australian economy (Minerals Council of Australia, 2003§). The combined Australian agriculture, food, and beverage industry accounted for about 5.5% of the GDP (Minerals Council of Australia, 2002§). In 2003, Australia was the world's leading producer of alumina, bauxite, monazite, opal, rutile, sapphire, and zircon; the second leading producer of mined nickel and mined zinc; the third leading producer of cobalt, diamond (by volume), gold, ilmenite, and iron ore; the fourth leading producer of black coal and mined copper; and the fifth leading producer of aluminum metal (Edelstein, 2004; Gambogi, 2004; Hedrick, 2004; Kirk, 2004; Kuck, 2004; Plachy, 2004; Plunkert, 2004; Shedd, 2004). It was the premier exporter of alumina, coal, ilmenite, iron ore, refined lead, monazite, rutile, and zircon (Resource Information Unit, 2003, map insert). The bountiful mineral wealth of Australia enabled the country to be virtually self-sufficient in most mineral commodities. The only significant mineral resource in which Australia was not self-sufficient was petroleum. Australia, nevertheless, produced an estimated 70% of its crude oil requirements domestically in 2003. Australia also was endowed with abundant resources of other mineral fuels, which included coal, natural gas, liquefied petroleum gas, and uranium, and the country continued to be one of the few market economy countries that was a net exporter of mineral fuels (U.S. Energy Information Administration, 2004§).

Government Policies and Programs

The Timor Sea Treaty between the Governments of Australia and East Timor entered into force on April 2, 2003, as Australian Treaty Series [2003] ATS 13. The treaty was to aid East Timor's economic development and to maintain investment security for existing and planned petroleum activities in an area of seabed located between Australia and East Timor known as the Joint Petroleum Development Area (U.S. Central Intelligence Agency, 2005§).

Structure of the Mineral Industry

The Australian mineral industry included industrial minerals, base metals, ferrous metals, nonferrous metals, precious metals, fuel minerals, and gemstones. Australia was one of the world's principal producers and suppliers of concentrates, ores, and refined metals. It was estimated to rank third in the world in the value of its nonfuel mineral production and fifth in the value of its mineral production when fuels were included.

The Australian mining industry was based on a system of free enterprise in which private companies were involved in exploration, mine development, production, mineral processing, and marketing. A number of companies in Australian mineral ventures were affiliates or subsidiaries of U.S. companies. Foreign companies controlled a large part of the mining, smelting, and refining sectors and a significant portion of the petroleum and natural gas sectors.

Many of the mineral industries were fully integrated and produced concentrates and ores or other intermediate products (for example, alumina) and refined metal or other end products (for example, cut and polished gem diamond) within the country.

The Australian mineral industry provided about 48,000 jobs directly, and about 240,000 jobs were provided in total, which included many in remote and regional areas, ports, and towns that were built as a result of mineral exploration, discovery, and extraction.

In 2003, Australia had 6 alumina refineries with a combined capacity of about 16.6 million metric tons per year (Mt/yr) and Comalco Ltd.'s 1.4-Mt/yr-capacity refinery under construction at Gladstone, Queensland, which was scheduled for completion in 2005; 6 aluminum smelters with approximately 1.8 Mt/yr total capacity; 3 copper smelters with a total capacity of about 610,000 metric tons per year (t/yr); 1 lead-zinc-silver refinery/smelter with production capacities of 250,000 t/yr, 40,000 t/yr, and 450,000 t/yr, respectively; 1 170,000-t/yr zinc refinery; 1 256,000-t/yr refined gold/81-t/yr refined silver precious-metals refinery; 1 22-t/yr gold smelter; 4 lead-zinc silver smelters with combined production capacities of 445,000 t/yr of lead, 360,000 t/yr of zinc, and 450 t/yr of silver; 1 260,000-t/yr manganese ferroalloy plant; 1 100,000-t/yr nickel smelter; 1 67,000-t/yr nickel refinery; 2 nickel-cobalt refineries with total capacities of 75,000 t/yr of nickel and 5,000 t/yr of cobalt; 3 principal crude steel plants; and 10 petroleum refineries.

Ownership of the mineral rights in Australia generally is vested in the Government of the relevant State or Territory or the Commonwealth Government for Federal lands and waters, regardless of ownership or tenure of the surface. Mineral ownership is divided between State ownership in State onshore areas and Commonwealth ownership in Territories and in offshore areas beyond Australia's 4.8-kilometer (km) territorial limit. The Commonwealth's responsibility for minerals (except uranium) in the Northern Territory was, however, transferred to the Government of the Northern Territory. Thus, the individual States and Territories administered the mineral industries within their own borders, which included registering land titles; issuing exploration and development permits; overseeing mining operations, which included administration of inspections; assuring compliance with health, safety, and environmental regulations; and levying royalties and taxes.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

The Commonwealth may restrict mineral exports for the good of the country and, therefore, has de facto control over most mineral production.

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Australia was the unchallenged leader for the 33d consecutive year in the production of bauxite, which was from the Northern Territory (the Gove Mine), northern Queensland (the Weipa Mine), and Western Australia (the Huntly, the Willowdale, and the Worsley Mines). The country produced almost 56 million metric tons (Mt) in 2003, which represented about 37% of world bauxite output. In terms of aluminum metal, Australia's production ranked fifth with about 7% of world production (Resource Information Unit, 2003, map insert). Bauxite deposits at Mitchell Plateau and Cape Bougainville in the north of Western Australia are uneconomic to develop but are potentially a significant future resource. Australia's aluminum industry was the country's second ranked commodity exporter, behind coal, when bauxite, alumina, and aluminum are taken into account.

Construction of Comalco's 1.4-Mt/yr alumina refinery at Gladstone, Queensland, was progressing on time, and commissioning was expected to begin in 2005. The Gladstone area already had two other alumina facilities in the area—Queensland Alumina Ltd.'s 3.8-Mt/yr Gladstone alumina refinery at Parsons Point and Boyne Smelters Ltd.'s 490,000-t/yr Boyne Island alumina smelter at Boyne Island (Resource Information Unit, 2003, p. 697).

Copper.—Australia continued to be a major copper-producing country in 2003. It had large mining and smelting operations at Olympic Dam, South Australia, and Mount Isa, Queensland. Other significant copper mining operations were Cadia Hill and Northparkes in New South Wales; Ernest Henry, Mount Gordon, and Osborne in Queensland; and Golden Grove and Nifty in Western Australia. The Mount Isa Mine, which also produced large tonnages of lead, silver, and zinc, was the leading copper producer in Australia and was one of the world's biggest underground mines (Resource Information Unit, 2002, p. 131-132).

In 2003, Australia's mined copper production ranked fourth in the world following Chile, Indonesia, and the United States (Edelstein, 2004).

Gold.—Australia has about 8% of world economic gold resources and ranked third in gold production after the Republic of South Africa and the United States, which accounted for about 11% of world output (Amey, 2004).

Australia has active gold mines in all States and in the Northern Territory. Western Australia was by far the leading producer. Much of the gold mined in Australia in 2003 was from large open pit mines. The gold was invisible to the naked eye.

Iron Ore and Steel.—Although iron ore resources occur in all six Australian States and the Northern Territory, about 97% of the 32 billion metric tons (Gt) of the EDR are in Western Australia; this includes about 90% in the Hamersley region, which was a major world iron ore province. In 2003, Australia, which ranked third following China and Brazil in iron ore mine production, produced about 17% of world production (Kirk, 2004).

The major iron ore producers that operated in the Hamersley Province were BHP Billiton Ltd., Hamersley Iron Pty. Ltd. (a wholly owned subsidiary of Rio Tinto Ltd.), and Robe River Iron Associates [a 53% owned joint venture of Rio Tinto with a Japanese consortium that comprised Mitsui & Co. (Australia) Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; and Sumitomo Metal Australia Pty. Ltd., 3.5%]. Portman Ltd. and ABM Mining Ltd. were smaller iron ore miners that operated the Cockatoo and the Koolyanobbing Mines in Western Australia and the Savage River Mine in Tasmania, respectively. OneSteel Ltd., which had been created when BHP Billiton divested some of its steel assets, operated the Whyalla Mines (formerly the Middleback Ranges Mines), which are located about 50 km west of Whyalla in South Australia and included the Iron Baron, the Iron Duchess, the Iron Duke, the Iron Knob, and the Iron Prince Mines. The Iron Baron and the Iron Knob Mines were almost depleted after more than a century of mining (Resource Information Unit, 2003, p. 180).

Lead, Silver, and Zinc.—Australia's lead, silver, and zinc mines were predominantly based on zinc-rich ore bodies with zinc as the major component and lead and silver as byproducts. An exception was BHP Billiton's Cannington underground mine in Queensland. It was based on a lead-silver ore body with zinc as a byproduct. The Cannington Mine, which had the largest single mine silver production in 2003, contributed more than 4% of global silver production and was the second largest known silver deposit in the world in terms of proved and probable reserves. MIM Holdings Ltd.'s Mount Isa and Hilton George Fisher deposits at Mount Isa, Queensland, ranked as the third and fifth largest known silver deposits, respectively, and together in 2003, ranked fifth among individual producers in the world.

Australia ranked first in the world in lead reserves, was tied with China in zinc reserves, and was third after Mexico and Peru in silver reserves owing to the development of the large zinc-lead-silver deposits at the Cannington, the Century, and the McArthur River Mines. These positions were further supported by the reserves of the many other base-metal and silver-bearing gold deposits of lesser size in Australia (Hilliard, 2004; Plachy, 2004; Smith, 2004).

Manganese.—Groote Eylandt Mining Co. Pty. Ltd. (GEMCO) mined about 15% of the world's manganese at its 2.4-Mt/yr-capacity 84-square-kilometer (km^2) Groote Eylandt open pit operations on the northwestern portion of Groote Eylandt, which is located in the west of the Gulf of Carpentaria, Northern Territory. The operations at Groote Eylandt used excavators and 145-metric-ton (t) end-dump trucks for removal of overburden and ore mining. The onsite concentrator produced clean lump and fines ore products that were trucked to Milner Port Bay for shipment. GEMCO shipped about 25% of its concentrates annually to the ferromanganese plant operated by Tasmanian Electro Metallurgical Co. Pty. Ltd. (a wholly owned subsidiary of BHP Billiton) at Bell Bay near Launceston, Tasmania. A smaller percentage was used in an electrolytic manganese dioxide plant at Newcastle, New South Wales, by Australian Manganese Co. Pty. Ltd. (a wholly owned subsidiary of BHP Billiton). The plant produced the high-grade material used in long-life batteries. Other GEMCO customers were the makers of ferroalloys and steel in Australia, Canada, China, Europe, Japan, Mexico, Norway, the Republic of Korea, and the United States (Corathers, 2004; Resource Information Unit, 2003, p. 109).

Pilbara Manganese Pty. Ltd. owned and operated the 300,000-t/yr-capacity manganese mine at Woodie Woodie, which is located 400 km southeast of Port Hedland, Western Australia. The mine also included the adjacent Bells, Hanna, and Lewis open pits; the Hanna Pit was depleted near yearend, and rehabilitation work had begun. The ores from the various pits were blended to produce a consistent product.

Mineral Sands.—Mineral sands deposits are concentrations of ilmenite, rutile, and zircon that occur along the coast of eastern Australia from central New South Wales to Cape York, Queensland. Large relic beach deposits are found as far inland as Ouyen, Victoria; in southwestern New South Wales; and in more than 300,000 km^2 of the Murray Basin, South Australia. In Western Australia, deposits are distributed from the southern tip of the state to Geraldton and are located at the coastline or as relic deposits up to 35 km inland. The eastern deposits generally have a total heavy-mineral content of from 1% to 5%; ilmenite, rutile, and zircon each make up about one-third. In Western Australia, the deposits also have a total heavy-mineral content of about the same or a slightly higher percentage, but the ilmenite portion of this content approaches about 70% (Minerals Council of Australia, undated a§). In 2003, Australia had a substantial portion of world mineral sands resources—45% for rutile, up to 45% for zircon, and about 32% for ilmenite (Gambogi, 2004; Hedrick, 2004).

Nickel and Cobalt.—Australia ranked first in economic resources of nickel and second in economic resourses of cobalt, after the Democratic Republic of the Congo [Congo (Kinshasa)]. Australia's main nickel ores were primary sulfides of nickel, which occur as lodes within mafic and ultramafic (iron- and magnesium-rich) igneous rocks that have a volcanic origin, although most of the world's identified resources are contained in nickel-bearing laterite and nickeliferous limonite. These are secondary deposits that are derived from the weathering of nickel-bearing mafic and ultramafic rocks in tropical and subtropical climates.

With about 17% of the world's nickel production in 2003, Australia moved into second place behind Russia (Kuck, 2004). Australia ranked third, following Zambia and Congo (Kinshasa), in mined cobalt in 2003 (Shedd, 2004). Most of Australia's nickel-cobalt mines are in the Kalgoorlie and the Leonora regions of Western Australia (Resource Information Unit, 2003, map insert).

Tin.—Murchison United NL's Renison Bell Mine in Tasmania and Marlborough Resources NL's Ardlethan Mine in central New South Wales were essentially Australia's only tin mines. Sons of Gwalia Ltd.'s Greenbushes Mine in Western Australia produced minor amounts of byproduct tin that was recovered along with the tantalum-bearing mineral tantalite. Australia supplied about 3% of world tin production in 2003 (Carlin, 2004). Ardlethan and Murchison shipped their concentrate overseas for processing. Ardlethan's went to the Malaysian Smelting Corp. in Penang, Malaysia, and Murchison's was sold to Thailand Smelting and Refining Co. Ltd. for smelting at Phuket, Thailand (Australian Journal of Mining, 2002).

In May 2003, Murchison suspended mining and treatment operations for 8 weeks to undertake maintenance work and to arrange recapitalization of the project through development of the South Renison decline to access the high-grade Federal ore bodies (Resource Information Unit, 2003, p. 196).

Industrial Minerals

Garnet.—GMA Garnet Pty. Ltd. produced industrial-grade garnet at its Port Gregory open pit, which is located 100 km north of Geraldton, Western Australia. The processed garnet product was used domestically (40%) and exported through the Ports of Freemantle and Geraldton to Asia, the United States, and Western Europe for use as an abrasive in industrial cleaning and maintenance and as a high-pressure cutting agent (Resource Information Unit, 2003, p. 233).

Gemstones.—Australia, which was the leading producer of precious opal in 2003, accounted for a large percentage of world production. About one-half of Australia's annual production was mined in South Australia's three major fields at Andamooka, Coober Pedy, and Mintabie, and many smaller fields that stretch from Andamooka to the Northern Territory border along the southwestern margin of the Great Artesian Basin. Most opal was hand mined in either open pits or underground drifts, and all grades from milky pinfire through crystal up to high-grade black were produced. Lambina, which was a newer field, increased its production at the expense of Coober Pedy, although Coober Pedy still produced, in terms of value, almost three times that of Lambina. Opal in New South Wales was mined at Lightning Ridge, which was the world's major source of the highly prized and valuable black opal. A small quantity of opal was produced in western Queensland.

In 2003, two diamond mines were operating in Australia—Rio Tinto's huge Argyle open pit in the Ellendale diamond province of the western Kimberley region of Western Australia and Kimberley Diamond Co.'s. Ellendale Mining Lease about 200 km to the southeast of the Argyle Mine. In early 2003, Argyle Diamond Mines Pty. Ltd. closed the Merlin diamond mine after the company failed to receive a viable sales offer (Resource Information Unit, 2003, p. 96, 222, 225).

Other diamond operations had various activities ongoing, which included drilling, sampling, trenching, tunneling, and/or washing of materials, but they did not produce any diamond.

Argyle was the world's single largest producer of diamond. Mining from the AK-1 lamproite pipe at Argyle began in 1985. Diamond also was recovered from alluvial material in the nearby Limestone and Smoke Creeks where initial mining at Argyle had begun in 1983 and continued through 2001. During 2002, this operation ended owing to resource depletion. The life of the open pit at Argyle was thought to extend to 2007, but because the AK-1 pipe continued at depth, underground mining could possibly extend the mine life to 2020 (Resource Information Unit, 2003, p. 223).

Diamond produced at Argyle was sorted in Perth and then prepared for international sale at Argyle's European sales office in Antwerp, Belgium. Argyle specialized in fancy diamond, such as champagne, cognac, and the rare pink (Resource Information Unit, 2002, p. 428).

Australia also continued to be a leading producer of natural sapphire. Commercial sapphire production was mined from alluvial deposits in the Inverell-Glen Innes (New England) region of northern New South Wales and the Rubyvale-Anakie region of central Queensland. Australia supplied as much as 30%, by volume, of the world's rough sapphire output. Most of the uncut gems were exported to Thailand, which was the recognized world leader for cutting and marketing.

Jade was discovered in the form of nephrite, which is one of the two recognized jade minerals (the other being jadeite), near Cowell on the Eyre Peninsula, South Australia. These deposits were the world's largest identified resource of nephrite jade. Australia produced most of the world's chrysoprase, which is known as Australian jade outside of Australia.

Australia produced such other gemstones as agate, amethyst, chiastolite, emerald (aquamarine), garnet, rhodonite, topaz, tourmaline, turquoise, and zircon (Primary Industries and Resources South Australia, 2000, p. 19; Resource Information Unit, 2002, p. 116-119).

Phosphate Rock.—Australia had two active phosphate rock operations in 2001. Christmas Island Phosphates Pty. Ltd. (a subsidiary of Western Australia's Phosphate Resources Ltd.) operated an open pit mine on Christmas Island (an overseas dependent area of Australia that is located about 360 km south of Java, Indonesia, in the Indian Ocean) and WMC Fertilizers Ltd. (the wholly owned subsidiary of WMC Ltd.) operated the Phosphate Hill-Duchess open pit mine southeast of Mount Isa, Queensland. Phosphate has been mined on Christmas Island since 1897.

In 1997, the Federal Government awarded a 21-year mining lease to Christmas Island Phosphates, which had been mining phosphate on the island under contract since 1990. Production was marketed to fertilizer manufacturers in Australia and Southeast Asia (Resource Information Unit, 2002, p. 378). Mining began in 1999 at the Phosphate Hill-Duchess Mine with a planned maximum rate of 2.2 Mt/yr of phosphate rock for the production of fertilizer. About one-half of production was sold domestically, and the remainder was exported to Southeast Asia and New Zealand (Australian Journal of Mining, 2002).

Mineral Fuels

Coal.—In 2003, Australia was the world's leading exporter of coal as it has been since 1984.

Petroleum and Natural Gas.—In 2003, Western Australia and the adjacent Commonwealth offshore areas accounted for about 55% of Australia's total oil and condensate and all the country's liquefied natural gas (LNG) production. Apart from having the appropriate geology, the country's enormous size (onshore and offshore) make these production levels possible. Onshore Western Australia has a land area of more than 2.5 million square kilometers, which is nearly four times the size of Texas. Additionally, the State's offshore area encompasses an area nearly four times larger than Europe's North Sea and larger than North America's Gulf of Mexico.

In 2003, Australia produced about 70% of its crude oil requirements. Australia's expanding oil deficit was primarily a result of demand steadily outpacing supply. The Australian Government has estimated that the country was using its crude petroleum about three times faster than exploration projects were discovering new production fields. By 2010, self-sufficiency was expected to slide to only 40% (U.S. Energy Information Administration, 2002§).

Australia has 10 crude oil refineries with a total distillation capacity of about 850,000 barrels per day (bbl/d). The country's three largest facilities were BP p.l.c.'s Kwinana Refinery in Western Australia, which had a capacity of 158,500 barrels per day (bbl/d) of crude oil; ChevronTexaco Corporation's Kurnel Refinery in New South Wales, 114,000 bbl/d of crude oil; and Exxon Mobil Corp.'s Altona Refinery in Victoria, 130,000 bbl/d of crude oil (U.S. Energy Information Administration, 2002§). The total number of petroleum exploration and development wells drilled during 2003 (181) was 11 more than that of 2002 (170). The number of onshore exploration wells drilled in 2003 (36) was 4 less than that of 2002 (40, revised). During 2003, the number of offshore exploration wells drilled increased to 55 compared with that of 2002 when 7 fewer wells were drilled. The total number of exploration wells drilled in 2003 increased to 91 from that drilled in 2002 (88). The total number of development wells drilled (90) was 8 more than that of 2002 (82); 61 wells were drilled onshore, which was a decrease of 7 wells compared with that of 2002; and 29 wells were drilled offshore compared with 26 wells drilled in 2002 (Geoscience Australia, 2003).

Uranium.—Australia had three active uranium mining operations in 2003—Heathgate Resources Pty. Ltd.'s Beverley in situ leach (ISL) operation in South Australia, which was the latest of the active uranium mines to come onstream; WMC's Olympic Dam underground copper-silver-gold-uranium mine also in South Australia, which was one of the largest mines in the world; and Energy Resources of Australia Ltd.'s (ERA) Ranger open pit mine in the Northern Territory, which was the oldest of the active mines. Because Australia has no significant national demand for uranium, virtually all production was exported. Uranium oxide, or yellowcake, exports were made only under close supervision of stringent international and bilateral safeguard regulations to ensure that it would be used only for peaceful purposes (Minerals Council of Australia, undated b§).

The Beverley Mine, which was South Australia's second leading uranium mine, was officially opened on February 21, 2001, although it had begun production in 2000 after receiving all environmental approvals to proceed. The uranium was being extracted by the ISL mining process, which enabled the resource to be recovered without major impact on the environment. The Beverley Mine was expected to produce about 1,000 t/yr of yellowcake for about 15 years, although ongoing exploration on surrounding leases was expected to extend the mine life. After being trucked to Port Adelaide, the yellowcake was shipped to the United States under sales agreements with nuclear power utilities. Heathgate Resources was a subsidiary of General Atomics, which was a uranium miner, processor, and nuclear power station designer headquartered in the United States (Heathgate Resources Pty. Ltd., 2001; Resource Information Unit, 2003, p. 188).

The Olympic Dam uranium operation included a fully integrated metallurgical complex with a grinding/concentrating circuit and a hydrometallurgical plant that incorporated a solvent extraction circuit for the production of about 4,300 t/yr of yellowcake. The bulk of the uranium production was committed under long-term sales contracts with electricity-generating facilities in Belgium, Canada, Finland, France, Japan, the Republic of Korea, Sweden, the United Kingdom, and the United States.

Yellowcake was first produced from the Ranger Mine in August 1981, and the life of the mine was anticipated to end in 2007, with processing of Ranger ore expected to be completed during 2010. All ERA's yellowcake sales were to energy companies in France, Germany, Japan, the Republic of Korea, Spain, Sweden, the United Kingdom, and the United States (Resource Information Unit, 2002, p. 404; Uranium Information Center, 2002§).

Reserves

Australia ranked as one of the leading mineral-resource nations. It had the largest EDR of lead, mineral sands, nickel, tantalum, uranium, and zinc in the world. Its EDR also ranked in the top six worldwide for bauxite, black and brown coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, rare-earth oxides, and silver (table 3; Geoscience Australia, 2004).

Infrastructure

The transportation infrastructure of Australia was well developed. Of the 913,000 km of roads, 353,331 km was paved, which included 1,363 km of expressways, and 559,669 km was unpaved. Inland waterways, of which 8,368 km was usable mainly by small shallow-draft craft, were of little importance to the transportation industry. The public sector railway system consisted of 46,200 km of track, of which 23,648 km was standard [1.435-meter (m)] gauge, 15,456 km was narrow (1.067-m) gauge, 2,193 km was broad (1.600-m) gauge, and 291 km was dual gauge. Australia had 4,612 km of electrified rail. Additionally, a few hundred kilometers of rail were privately owned and served mainly the iron ore industry in Western Australia. Of the 444 airports in operation in 2003, 294 were principal with permanent-surface runways. International shipping ports included Adelaide, Brisbane, Cairns, Darwin, Devonport (Tasmania), Esperance, Fremantle, Geelong, Hobart (Tasmania), Launceston (Tasmania), Mackay, Melbourne, Sydney, and Townsville. The merchant marine fleet included 7 petroleum-oil-lubricant tankers; 3 chemical tankers; 4 LNG tankers; 35 bulk, roll-on/off, cargo-container freighters; and 2 passenger vessels. Pipelines included 5,600 km for natural gas, 2,500 km for crude oil, and 500 km for refined petroleum products (U.S. Central Intelligence Agency, 2003§).

Electricity-generating capacity was 43 gigawatts, of which 84% was thermal (mostly coal) and 14% was hydroelectric power (U.S. Energy Information Administration, 2004§).

Outlook

Australia continued its position as one of the world's leading mineral-producing nations in 2003. This position is expected to hold well into the future owing to its large EDRs, especially bauxite, gold and silver, lead, nickel, mineral sands, tantalum, uranium, and zinc.

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TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003p
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	48,416	53,802	53,799	54,135 r	55,602
Alumina	do.	14,532	15,680	16,313	16,382 r	16,529
Metal, refined:						
Primary	do.	1,718	1,769	1,798	1,817	1,857
Secondary		108,000 r	110,000 e	127,000	127,000	127,200 e
Antimony, Sb content of ores and concentrates		1,679	1,511	1,380	1,200 e	900 e
Cadmium:						
Mine output, Cd content e		1,900	1,900	1,900	1,900	1,900
Metal, smelter, refined		462	552	378	370 r	350
Chromium, chromite, gross weight		70,000	90,000	11,800	132,665	138,826
Cobalt:						
Co content in laterite ore, Ni concentrate, and Zn concentrate		4,100 r	5,600 r	6,200	6,500 r	7,000
Metal, refined		1,700	2,610	3,470	3,500 e	3,840
Columbium-tantalum concentrate, gross weight		1,230	1,600	2,220	3,100	1,140
Copper:						
Mine output, Cu content	thousand tons	741	832	873	883	830
Metal:						
Smelter, primary	do.	332	387	456	469	435
Refined:						
Primary	do.	412	484	558	543	484
Secondary e	do.	25	-- r	-- r	-- r	-- [2]
Gold:						
Mine output, Au content	kilograms	301,070	296,410	285,030	273,010	282,000
Metal, refined:						
Primary	do.	376,000	349,000	304,770	300,000 e	252,000
Secondary	do.	66,000	7,640	68,310	68,000 e	100,000 e
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	151,558	171,508	181,435	182,704	187,219
Fe content	do.	93,807	106,563	112,592	113,548	116,355
Metal:						
Pig iron	do.	7,468	7,000 e	7,200	8,574 r	9,660
Ferroalloys: e						
Ferromanganese		98,000	115,000	115,000	115,000	115,000
Silicomanganese		116,000	135,000	135,000	135,000	135,000
Total		214,000	250,000	250,000	250,000	250,000
Steel, crude	thousand tons	8,481	7,297	7,076	8,242	9,660
Semimanufactures e		5,000	5,000	5,000	5,000	5,000
Lead:						
Mine output, Pb content	thousand tons	681	739	714	683	688
Metal:						
Primary:						
Bullion	do.	162	139	195	181	169
Refined	do.	239	223	237	287	270
Total	do.	401	362	432	468	439
Secondary excluding remelt	do.	33	28	33 r	34 r	40
Manganese ore, metallurgical:						
Gross weight	do.	1,900	1,613	2,069	2,187	2,555
Mn content	do.	929	787	948	983	1,247
Nickel:						
Mine output, Ni content	do.	119 r	166	205 r	208 r	179
Metal, smelter, refined Ni and Ni content of oxide	do.	83	112	128	133	209
Platinum-group metals:						
Palladium, Pd content	kilograms	816	812	828	800 e	820 e
Platinum, Pt content	do.	90	171	174	200 e	225 e
Total	do.	906	983	1,002	1,000 e	1,050 e

See footnotes at end of table.

TABLE 1--Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003[p]
METALS--Continued						
Silver:						
Mine output, Ag content		1,720	2,060	1,970	2,077	1,868
Metal, refined		472	538	576	542	227
Tin:						
Mine output, Sn content		10,011	9,146	9,802	6,268	3,819
Metal, refined:						
Primary		585	733	1,094	611	597
Secondary[e]		300	300	400	400	400
Titanium concentrates, gross weight:						
Ilmenite	thousand tons	1,976	2,146	2,017	1,917	2,006
Leucoxene		32,000	27,000	30,000	39,000	57,000
Rutile		179,000	208,000	206,000	218,000	173,000
Zinc:						
Mine output, Zn content	thousand tons	1,163	1,420	1,519	1,469	1,479
Metal, smelter:						
Primary	do.	344	490	554	567	553
Secondary[e]		4,500	4,500	4,500	4,500	4,500
Zirconium concentrates, gross weight	thousand tons	359	374	394	412	462
INDUSTRIAL MINERALS						
Abrasives, natural:[e]						
Beach pebble		2,000	2,000	2,000	2,000	2,000
Garnet		25,000	25,000	25,000	25,000	25,000
Barite[e]		18,000	20,000	20,000	20,000	20,000
Cement, hydraulic[e]	thousand tons	7,450	7,500	7,500	7,550	8,000
Clays:[e]						
Bentonite and bentonitic clay		180,000	180,000	180,000	200,000	200,000
Brick clay and shale	thousand tons	8,000	8,000	8,000	8,000	8,000
Cement clay and shale	do.	500	500	500	500	500
Damourite clay		100	100	100	100	100
Fire clay		25,000	25,000	25,000	25,000	25,000
Fuller's earth, attapulgite		5,639 [2]	5,600	5,600	6,000	6,000
Kaolin and ball clay		200,000	220,000	220,000	230,000	240,000
Other	thousand tons	1,000	1,000	1,000	1,000	2,000
Diamond:						
Gem	thousand carats	16,381	14,656	14,397	15,136	13,981
Industrial	do.	13,403	11,992	11,779	18,500	17,087
Total	do.	29,784	26,648	26,176	33,636	31,068
Diatomite[e]		20,000	20,000	20,000	20,000	20,000
Feldspar including nepheline syenite[e]		49,600	50,000	50,000	50,000	50,000
Gemstones, other than diamond:						
Opal	value, million $Australian	54	76	70	62	65
Sapphire	do.	6	8	6	1	--
Total	do.	60	84	76	63	65
Gypsum[e]	thousand tons	1,900 [r]	2,500 [r]	3,800	3,800 [r]	4,000
Kyanite[e]		1,000	1,000	1,000	1,000 [r]	1,000
Lime[e]		1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Magnesite		280,505	349,783	605,314	484,314	472,668
Nitrogen, N content of ammonia		430,900	575,500	762,200	686,400	700,000
Perlite, crude[e]		5,000	5,000	5,000	5,000	5,000
Phosphate rock	thousand tons	2,000	2,108	977,100	2,024,580	2,100,000 [e]
Salt	do.	10,022	8,798	9,536	10,000 [e]	10,400 [e]
Sillimanite[e, 3]		300	300	300	300	300
Spodumene, concentrate		75,824	81,891	63,443	100,000 [e]	110,000 [e]
Stone and sand and gravel:[e]						
Construction sand	thousand tons	33,000	33,000	35,000	38,000	40,000
Gravel	do.	15,000	15,000	15,000	15,000	20,000
Dolomite	do.	10,000	10,000	10,000	10,000	10,000
Limestone, for cement	do.	6,000	6,000	6,000	10,000	10,000
Limestone, for other uses	do.	6,000	6,000	6,000	10,000	10,000
Silica in the form of quartz, quartzite, glass sand	do.	2,500	4,266	4,500	4,500	5,000

See footnotes at end of table.

TABLE 1--Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003[p]
INDUSTRIAL MINERALS--Continued						
Stone and sand and gravel--Continued:[e]						
Other:						
Crushed and broken stone	thousand tons	75,000	80,000	80,000	80,000	80,000
Dimension stone	do.	110	120	120	120	120
Unspecified	do.	30,000	30,000	30,000	30,000	30,000
Sulfur, byproduct:						
Metallurgy	do.	441	654	817	899	900
Petroleum	do.	25	30	45	60	60
Total	do.	466	684	862	959	960
Talc, chlorite, pyrophyllite, steatite		190,384	180,272	174,946	172,241	174,000 [e]
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous and subbituminous	thousand tons	238,200	245,500	264,680	347,890	257,790
Lignite[e]	do.	66,000	67,000	70,000	73,000	67,000
Total[e]	do.	304,200	312,500 [r]	334,680 [r]	420,890 [r]	325,000
Coke, metallurgical[e]	do.	325	325	300	300	300
Fuel briquets[e]	do.	750	750	800	800	800
Gas, natural, marketed	million cubic meters	30,743	30,794	30,000 [e]	31,000 [e]	30,000 [e]
Natural gas liquids	thousand 42-gallon barrels	47,097	47,260	47,000 [e]	47,300 [e]	47,000 [e]
Peat[e]		15,000	30,000 [r]	30,000	30,000	50,000
Petroleum:						
Crude	thousand 42-gallon barrels	226,665	263,500	231,000	240,000 [e]	250,000 [e]
Refinery products:						
Gasoline:						
Aviation	do.	1,069	975	868	900 [e]	950 [e]
Motor	do.	120,991	113,228	112,767	113,000 [e]	115,000 [e]
Jet fuel	do.	33,610	35,585	362,138	363,000 [e]	365,000 [e]
Kerosene	do.	704	147	245	250 [e]	300 [e]
Distillate fuel oil	do.	84,833	80,222	84,862	85,000 [e]	85,000 [e]
Residual fuel oil	do.	10,190	12,442	12,132	12,100 [e]	12,000 [e]
Lubricants	do.	4,038	4,284	3,950	4,000 [e]	4,000 [e]
Liquefied petroleum gas	do.	4,642	10,536	11,145	11,200 [e]	115,000 [e]
Bitumen	do.	4,000 [e]	4,328	4,610	5,000 [e]	5,000 [e]
Unspecified	do.	6,932	7,574	4,654	5,000 [e]	5,000 [e]
Total[4]	do.	271,000 [r]	269,321	597,371	599,000 [r, e]	604,000 [e]
Uranium, mine output, U_3O_8 content		5,992 [5]	7,588 [5]	7,680 [5]	3,536	8,912 [2]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary [r] Revised.

-- Zero.

[1] Includes data available through October 1, 2004.

[2] Reported figure.

[3] In addition, about 7,000 metric tons per year of sillimanite clay (also known as kaolinized sillimanite) that contains from 40% to 48% aluminum oxide is produced.

[4] Excludes refinery fuel and losses.

[5] U content.

TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Alumina	Queensland Alumina Ltd., operator [Rio Tinto Ltd., 30.3%; Kaiser Aluminum and Chemical Corp. (Australia) Ltd., 28.3%; Alcan South Pacific Pty. Ltd., 21.4%; Pechiney Australia Pty. Ltd., 20%]	Gladstone alumina refinery, QLD	3,800
Do.	Alcan Northern Territory Pty. Ltd., 70%, and Alcan South Pacific Pty. Ltd., 30%	Gove alumina refinery, NT	1,900
Do.	Alcoa World Alumina Australia, 100%	Kwinana alumina refinery, WA	2,100
Do.	do.	Pinjarra alumina refinery, WA	3,400
Do.	Alcoa World Alumina Australia, 60%, and Western Mining Corp., 40%	Wagerup alumina refinery near Waroona, WA	2,200
Do.	Worsley Alumina Pty. Ltd., manager [Billiton Aluminium Australia Pty. Ltd., 86%; Billiton Plc, 30%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; Nissho Iwai Alumina Pty. Ltd., 4%]	Worsley alumina refinery, 20 km NW of Collie, WA	3,200
Aluminum	Comalco Aluminium (Bell Bay) Ltd., 100%	Bell Bay aluminum smelter, TAS	142
Do.	VAW Kurri Kurri Pty. Ltd., 100%	Kurri Kurri aluminum smelter, NSW	150
Do.	Boyne Smelters Ltd., operator (Rio Tinto Ltd., 64%; Sumitomo Light Metal Industries Ltd., 17%; Ryowa Development Pty. Ltd., 12%, Kobe Steel Ltd., 5%; Sumitomo Chemical Co. Ltd., 2%)	Boyne Island aluminum smelter, QLD	490
Do.	Alcoa of Australia, 100%	Point Henry aluminum smelter, VIC	185
Do.	Alcoa of Australia, 45% and manager; China International Trust Investment Co. (a Chinese Government agency), 2.5%; Marubeni Australia Pty. Ltd., 22.5%; Eastern Aluminum Ltd., 10%	Portland aluminum smelter, VIC	345
Do.	Tomago Aluminium Co. Pty. Ltd., operator (Gove Aluminium Finance Ltd., 36%; Pechiney Australia Pty. Ltd., 36%; Australian Mutual Provident Society, 16%; VAW Australia Pty. Ltd., 12%)	Tomago aluminum smelter, NSW	444
Antimony	New England Antimony Mines NL, 100%	Hillgrove underground antimony-gold mine, 25 km E of Armidale, NSW	4
Bauxite	Alcan Inc., 100%	Gove open pit bauxite mine, Gove Peninsula, NT	7,000
Do.	Alcoa World Alumina Australia, 100%	Huntly open pit bauxite mine, 80 km S of Perth, WA	20,000
Do.	Comalco Ltd., operator (Rio Tinto Plc, 100%)	Weipa-Andoom open pit bauxite mine, Weipa, QLD	12,000
Do.	do.	Willowdale open pit bauxite mine, 130 km S of Perth, WA	8,600
Do.	Worsley Alumina Pty. Ltd., manager [BHP Billiton Ltd., 86%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; Nissho Iwai Alumina Pty. Ltd., 4%]	Worsley open pit bauxite mine, 50 km NE of Collie, WA	11,000
Bentonite	Arumpo Bentonite Pty. Ltd., 100%	Arumpo open pit bentonite mine, 95 km NE of Mildura, NSW	10
Do.	Unimin Australia Ltd., 100%	Cressfield open pit bentonite mine, 20 km N of Scone, NSW	12
Do.	do.	Miles open pit bentonite mine, 350 km W of Brisbane, QLD	100
Cement	Blue Circle Southern Cement Ltd., 100%	Berrima Cement Plant, NSW	1,200
Do.	Adelaide Brighton Cement Ltd., 100%	Birkenhead Cement Plant, SA	1,000
Do.	Queensland Cement Ltd., 100%	Darra Cement Plant, QLD	700
Do.	Adelaide Brighton Cement Ltd., 100%	Geelong Cement Plant, VIC	800
Do.	Goliath Cement Holdings Ltd., 100%	Railton Cement Plant, TAS	1,000
Do.	Cockburn Cement Ltd., 100%	South Coogee Cement Plant, WA	1,000
Chromite	Sylvania Resources Ltd., 100%	Coobina open pit chromite mine, 56 km ESE of Newman, WA	100
Coal, black	Powercoal Pty. Ltd., 100%	Angus Place longwall coal mine, 16 km NW of Lithgow, NSW	2,200

See footnotes at end of table.

TABLE 2--Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Coal, black--Continued:	BHP Steel (AIS) Pty. Ltd., 100%	Appin longwall coal mine, 40 NW of Wollongong, NSW	3,300
Do.	Powercoal Pty. Ltd., 100%	Awaba underground coal mine, 30 km SW of Newcastle, NSW	2,000
Do.	Oakbridge Pty. Ltd., 95%, and Sumitomo Corp., 5%	Baal Bone longwall coal mine, 24 km NW of Lithgow, NSW	3,500
Do.	BHP Billiton Hunter Valley Energy Coal, 100%	Bayswater open pit coal mine, 33 km NW of Singleton, 13 km SSW of Muswellbrok, NSW	5,500
Do.	Coal and Allied Industries Ltd., 40% and manager (Wesfarmers Bengalla Ltd., 40%; MCDA Bengalla Investment Pty. Ltd., 10%; Taipower Bengalla Pty. Ltd., 10%)	Bengalla open pit coal mine, 5 km W of Muswellbrook, NSW	5,000
Do.	Berrima Coal Pty. Ltd., 100%	Berrima underground coal mine, 60 km NE of Goulburn, NSW	2,000
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Blackwater open pit coal mine (includes South Blackwater), 195 km W of Rockhamton, QLD	13,500
Do.	Xstrata Coal Australia Pty. Ltd., manager (Oakbridge Pty. Ltd., 87.5%, and Nippon Steel Australia Pty. Ltd., 12.5%	Bulga open pit/longwall coal mine, 16 km SW of Singleton, NSW	11,000
Do.	Pacific Coal Pty. Ltd., 57.195% and manager [Leichhardt Coal Pty. Ltd., 31.419%; EPDC (Australia) Pty. Ltd., 7.9723%; and Japan Coal Development Co. Ltd., 3.416%]	Blair Athol open pit coal mine, 110 km NW of Emerald, 25 km NW of Clermont, QLD	11,000
Do.	Bloomfield Collieries Pty. Ltd., 100%	Bloomfield open pit coal mine, 20 km NW of Newcastle, 5 km SE of Maitland, NSW	1,300
Do.	Anglo Coal Holdings Australia Ltd., 100%	Boundary Hill open pit coal mine (includes Callide), 115 km to 140 km W of Gladstone, QLD	7,250
Do.	RAG Australia Pty. Ltd., manager (Burton Coal Pty. Ltd., 95%, and Thiess Pty. Ltd., 5%)	Burton open pit coal mine, 150 km SW of Mackay, QLD	5,800
Do.	Camberwell Coal Pty. Ltd., manager [Toyota Tsusho Mining (Australia) Pty. Ltd., 90%, and Dia Coal Mining (Australia) Pty. Ltd., 10%]	Camberwell open pit coal mine, 10 km NW of Singleton, NSW	4,000
Do.	LakeCoal Pty. Ltd., 80%, manager; Catherine Hill Resources Pty. Ltd., 20%	Chain Valley underground coal mine, 48 km S of Newcastle, NSW	3,000
Do.	Centennial Coal Co. Ltd., 85%, manager; SK Australia Pty. Ltd., 15%	Clarence underground coal mine, 10 km E of Lithgow, NSW	2,200
Do.	Roche Mining Pty. Ltd., operator (Millmerran Power Partners, 100%)	Commodore open pit coal mine, 80 km S of Toowoomba, QLD	3,600
Do.	Xstrata Coal Australia Pty. Ltd., 50%; Centennial Coal Co. Ltd., 45%; Tokyo Boeki Ltd., 5%	Cook underground coal mine, near Blackwater, QLD	1,000
Do.	Powercoal Pty. Ltd., 100%, manager	Cooranbong underground coal mine, 35 km SW of Newcastle, NSW	1,600
Do.	Australian Premium Coals Pty. Ltd., manager (Macarthur Coal Ltd., 45%; QCR No. 2 Pty. Ltd., 20%; CPB Coals Pty., 10%; Citic Australia Coal Ltd., 5%; Marubeni Coal Pty. Ltd., 7.5%; Nissho Iwai Australia Ltd., 7.5%; Kawasho Group, 3%; Nittetsu Shoji, 2%)	Coppabella open pit coal mine, 150 km SW of Mackay, QLD	4,700
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Crinum longwall coal mine, 45 km NE of Emerald, QLD	4,000
Do.	Cumnock No. 1 Colliery Pty. Ltd., 100%	Cumnock No. 1 open pit/longwall coal, 28 km NW of Singleton, NSW	2,750
Do.	Curragh Queensland Mining Ltd., 100%	Curragh open pit coal mine, 70 km E of Emerald, QLD	5,000
Do.	Anglo Coal Holdings Australia Ltd., 93%, and Ssangyong Resources Ltd., 7%	Dartbrook longwall coal mine, 70 km N of Singleton, NSW	3,750
Do.	BHP Billiton Ltd., 100%	Dendrobium longwall coal mine, 15 km SW of Wollongong, NSW	5,200
Do.	Anglo Coal Holdings Australia Ltd., 88.2% and manager; Mitsui Coal Development Australia Pty. Ltd., 3.8%; Mitsui Mining (Australia) Pty. Ltd., 3%; Daesung Australia Pty. Ltd., 2.5%; and Hyundai (Australia) Pty. Ltd., 2.5%	Drayton open pit coal mine, 35 km NW of Singleton, NSW	5,000

See footnotes at end of table.

TABLE 2--Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Coal, black--Continued:	Ebenezer Mining Co., 100%	Ebenezer open pit coal mine, 40 km SW of Brisbane, QLD	1,500
Do.	BHP Steel (AIS) Pty. Ltd.	Elouera longwall coal mine, 15 km SW of Wollongong, NSW	2,000
Do.	Idemitsu Kosan Co. Ltd., 85%; EPDC (Australia) Pty. Ltd., 10%; LG International (Australia) Pty. Ltd., 5%	Ensham-Yongala open pit coal mine, 40 km NE of Emerald, QLD	5,500
Do.	Griffin Coal Mining Co. Pty. Ltd., 100%	Ewington II open pit coal mine, 8 km E of Collie, WA	1,000
Do.	CAML Resources Pty. Ltd., 63%; Itochu Corp., 20.6%; Bowen Basin Investments Pty. Ltd., 16.4%	Foxleigh open pit coal mine, Bowen Basin, QLD	2,300
Do.	Anglo Coal Holdings Australia Ltd., 100% of German Creek and 75.04% of German Creek East; Marubeni Coal Pty. Ltd., 24.96% of German Creek East	German Creek and German Creek East open pit/longwall coal mines, 275 km WNW of Rockhampton, QLD	6,000
Do.	Console Energy Inc., 50% and Namoi Hunter Pty. Ltd., 50%	Glennies Creek longwall coal mine, 12 km N of Singleton, NSW	2,500
Do.	BHP Billiton Ltd., 80% at Riverside and 50% at Goonyella; Mitsubishi Corp., 50% at Goonyella; BHP Mitsui Coal Pty. Ltd., 20% at Riverside	Goonyella-Riverside open pit coal mines, 140 km SW of Mackay, QLD	11,000
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Gregory open pit coal mine, 60 km N of Emerald, QLD	5,500
Do.	Coal and Allied Industries Ltd., 100% and manager	Hunter Valley Operations (includes Carrington Chestnut, Howick, Hunter Valley No. 1, Lemington, Riverview open pit coal mines), 10 km W to 25 km N of Singleton, NSW	15,000
Do.	New Hope Corp. Ltd., 100%	Jeebropilly open pit coal mine, 35 km SW of Brisbane, QLD	1,500
Do.	Queensland Coal Mine Management Pty. Ltd., 70%; Winnin Pty. Ltd., 15%; Marubeni Coal Pty. Ltd., 15%	Jellinbah East open pit coal mine, 90 km E of Emerald, QLD	3,000
Do.	Pacific Coal Pty. Ltd., 80%, and Kestrel Coal Investment Pty. Ltd., 20%	Kestrel longwall coal mine, 40 km NNE of Emerald, QLD	3,300
Do.	Xstrata Coal Australia Pty. Ltd., 67%, and Mitsui Matushima Australia Pty. Ltd., 32.5%	Liddell open pit coal mine, 25 km NW of Singleton, NSW	4,000
Do.	Burragorang Valley Coal Pty. Ltd., 100%	Metropolitan longwall coal mine, 30 km N of Wollongong, NSW	1,400
Do.	LakeCoal Pty. Ltd., 80%, and Catherine Hill Resources Pty. Ltd., 20%	Moonee longwall coal mine, 37 km S of Newcastle, NSW	1,200
Do.	Anglo Coal Holdings Australia Ltd., 88%; Nippon Steel Australia Pty. Ltd., 5%; Tomen Coal Resources Pty. Ltd., 3.75%; private interests, 3.25%	Moranbah North longwall coal mine, 150 km SW of Mackay, QLD	5,700
Do.	Hunter Valley Coal Corp., 100%	Mount Owen open pit coal mine, 20 km NW of Singleton, near Ravensworth, NSW	8,000
Do.	Coal and Allied Industries Ltd., 80%, and Pohang Steel Australia Pty. Ltd., 20%	Mount Thorley open pit coal mine, 14 km SW of Singleton, NSW	6,500
Do.	Mitsui & Co. (Australia) Ltd., 100%	Moura open pit coal mine, 185 km W of Gladstone, QLD	4,400
Do.	The Griffin Coal Mining Co. Pty. Ltd., 100%	Muja open pit coal mine, 18 km SE of Collie, WA	2,000
Do.	Powercoal Pty. Ltd., 100%	Munmorah underground coal mine, 55 km S of Newcastle, NSW	7,000
Do.	Muswellbrook Coal Co., 100%	Muswellbrook No. 2 open pit coal mine, 4 km NE of Muswellbrook, Hunter Valley NSW	1,700
Do.	Powercoal Pty. Ltd., 100%	Myuna underground coal mine, 35 km S of Newcastle, NSW	1,500
Do.	Nardell Coal Corp., 100%	Nardell underground coal mine, 18 km NW of Singleton, NSW	1,200
Do.	MIM Holdings Ltd., manager (Collinsville Coal Co. Pty. Ltd., 75%, and Itochu Coal Resources Australia Pty. Ltd., 25%)	Newlands-Collinsville-Abbot Point open pit/longwall coal mine, 130 km west of Mackay, QLD	7,000
Do.	Powercoal Pty. Ltd., 100% and manager	Newstan longwall coal mine, 30 km SW of Newcastle, NSW	2,700

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Coal, black--Continued:	Rag Coal International AG, 40%, and Thiess Pty. Ltd., 40%	North Goonyella longwall coal mine, 180 km W of Mackay, QLD	3,000
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%	Norwich Park open pit coal mine, 85 km NNE of Emerald, QLD	4,000
Do.	Oaky Creek Coal Pty. Ltd., 75%; Sumitomo Coal Australia Pty. Ltd., 15%; Itocho Coal Resources Australia Pty. Ltd., 10%, of Oaky Creek; Namoi Highwall Pty. Ltd., 50%, and Sumitomo Coal Australia Pty. Ltd., 50%, of Alliance	Oaky Creek longwall and Alliance open pit coal mines, 300 km WNW of Rockhampton, QLD	9,500
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%	Peak Downs open pit coal mine, 145 km N of Emerald, QLD	7,500
Do.	Wesfarmers Premier Coal Ltd., 100%	Premier open pit coal mine, 10 km SE of Collie, WA	4,000
Do.	Xstrata Coal Australia Pty. Ltd., 100% of Ravensworth and 50% at Narama; Iluka Resources Ltd., 50% at Narama	Ravensworth-Narama open pit coal mine (includes Ravensworth East), at Lemington, 20 km NW of Singleton, NSW	6,200
Do.	Bloomfield Colliers Pty. Ltd., 100%	Rixs Creek open pit coal mine, 5 km NW of Singleton, NSW	2,000
Do.	BHP Mitsui Coal Pty. Ltd., 100%	South Walker Creek open pit-underground coal mine, 90 km SW of Mackay, 20 km W of Nebo, QLD	3,500
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%	Saraji open pit coal mine, 125 km N of Emerald, QLD	5,000
Do.	Southland Coal Pty. Ltd., 90%, and Thiess Pty. Ltd., 10%	Southland longwall coal mine, 40 km W of Newcastle, NSW	2,000
Do.	G.C. Springvale Pty. Ltd., 50%, and Samsung Development (Australia) Pty. Ltd., 50%	Springvale longwall coal mine, 16 km NW of Lithgow, NSW	2,000
Do.	Austral Coal Ltd., 100%	Tahmoor longwall coal mine (includes Tahmoor North and Bargo), near Picton, about 70 km SW of Sydney, NSW	2,000
Do.	Pacific Coal Pty. Ltd., 100%	Tarong-Meandu open pit coal mine, 85 km N of Toowoomba, QLD	5,500
Do.	BHP Steel (AIS) Pty. Ltd., 100%	Tower longwall coal mine, 32 km NW of Wollongong, NSW	2,000
Do.	Ulan Coal Mines Ltd., 10%, and Mitsubishi Development Pty. Ltd., 10%	Ulan open pit-longwall coal mine, 45 km NW of Mudgee, NSW	12,000
Do.	Xstrata Coal Australia Pty. Ltd., 95%, and United Mine Workers, 5%	United Collieries underground coal mine, 15 km W of Singleton, NSW	1,600
Do.	Wambo Coal Pty. Ltd., 100%	Wambo longwall coal mine, 15 km W of Singleton, NSW	3,100
Do.	Coal and Allied Industries, Ltd., 55.574%; Mitsubishi Coal Development Pty. Ltd., 28.898%; Nippon Steel Australia Pty. Ltd., 9.528%; Mitsubishi Corp., 6%	Warkworth open pit coal mine, 11 km SW of Singleton, NSW	6,400
Do.	BHP Steel (AIS) Pty. Ltd., 100%	West Cliff longwall coal mine, 43 km NW of Wollongong, NSW	3,000
Do.	Oceanic Coal Australia Ltd., 70%; Marubeni Coal Pty. Ltd., 17%; Ocal Macquarie Pty. Ltd., 10%; Kokan Kogyo (Australia) Pty. Ltd., 3%	West Wallsend longwall coal mine, 25 km SW of Newcastle, NSW	3,000
Do.	Powercoal Pty. Ltd., 100%	Wyee longwall coal mine, 40 km S of Newcastle, NSW	1,200
Coal, brown	Alcoa World Alumina Australia, 100%	Anglesea open pit lignite mine, 97 km SW of Melbourne, near Geelong, VIC	1,200
Do.	Hazelwood Power, 100%	Hazelwood open pit lignite mine at Morwell, 150 km SE of Melbourne, VIC	19,500
Do.	Loy Yang Power Ltd., 100%	Loy Yang open pit lignite mine at Traralgon, 165 km E of Melbourne, VIC	32,000
Do.	Auspower Pty. Ltd., 73.6%; Powergen Plc., 18.4%; Deutsche Asset Management, 8%	Yallourn open pit lignite mine, 140 km SE of Melbourne, VIC	18,500
Cobalt	Preston Resources Ltd., 100%	Bulong open pit nickel-cobalt mine, 30 km E of Kalgoorlie, WA	0.1

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Cobalt--Continued:	OM Group Inc., 100%	Cawse open pit nickel-cobalt mine, 50 km NW of Kalgoorlie, WA	0.2
Do.	Anaconda Nickel Ltd., 60%, manager; Glencore Australia Pty. Ltd. International AG, 40%	Murrin Murrin open pit nickel-cobalt mine, 60 km E of Leonora, WA	0.1
Do.	Australian Nickel Mines NL, 100%	Radio Hill underground nickel-cobalt mine, 100 km ESE of Karratha, WA	0.2
Do.	QNI Pty. Ltd., 100%	Yabulu nickel-cobalt refinery, Townsville, QLD	2
Copper	Newcrest Mining Ltd., 100%	Cadia Hill open pit gold-copper mine, 21 km SSW of Orange, NSW	25
Do.	Glencore Australia Pty. Ltd., 100%	Cobar underground copper mine, 10 km NW of Cobar, NSW	30
Do.	Amalg Resources NL, 100%	Eloise underground copper mine, 60 km SE of Cloncurry, QLD	70
Do.	MIM Holdings Ltd., 51%, and Westpac Banking Corp., 49%	Ernest Henry open pit copper-gold mine, 35 km NE of Cloncurry, QLD	105
Do.	Murchison Zinc Co. Pty. Ltd., 100%	Golden Grove underground zinc-copper mine (includes Gossan Hill and Scuddles), 225 km E of Geraldton, WA	6
Do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%	Highway-Reward open pit and underground copper mine, 37 km S of	185
Do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	1
Do.	Copper Refineries Pty. Ltd., operator (MIM Holdings Ltd., 100%)	MIM copper refinery, Townsville, QLD	270
Do.	MIM Holdings Ltd., 100%	MIM copper smelter, QLD	250
Do.	Matrix Metals Ltd., 100%	Mount pithbert open pit mine (includes Mount Watson), 90 km NW of Cloncurry, QLD	8
Do.	Western Metals Ltd., 100%	Mount Gordon open pit copper mine (includes Esperanza and Mammoth), 125 kilometers N of Mount Isa	46
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	275
Do.	Copper Mines of Tasmania Pty. Ltd., 100%	Mount Lyell underground copper-gold mine, 2 km NE of Queenstown, TAS	35
Do.	Straits (Nifty) Pty. Ltd., 100%	Nifty open pit copper mine, 200 km SE of Marble Bar, WA	22
Do.	Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%	Northparkes open pit/underground copper-gold mine, 27 km N of Parkes, NSW	55
Do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA	220
Do.	do.	Olympic Dam copper refinery, SA	220
Do.	do.	Olympic Dam copper smelter, SA	70
Do.	Placer Dome Asia Pacific Ltd., 100%	Osborne underground copper-gold mine, 195 km SE of Mount Isa, QLD	50
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	3
Do.	Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; Nissho Iwai Corp., 17.5%; Itochu Corp., 10%	Port Kembla copper refinery, NSW	120
Do.	do.	Port Kembla copper smelter, NSW	120
Do.	Newcrest Mining Ltd., 100%	Ridgeway underground gold-copper mine, 25 km S of Orange, NSW	30
Do.	Pasminco Ltd., 100%	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	1

See footnotes at end of table.

TABLE 2--Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Copper--Continued:	Selwyn Mines Ltd., 100%	Selwyn underground copper-gold mine, 150 km SE of Mount Isa, QLD	17
Diamond thousand carats	Rio Tinto Ltd., 100%	Argyle Mine (AK-1 lamproite pipe and alluvial diamond mines), 120 km SW of Kununurra, WA	26,000
Do. do.	do.	Merlin open pit diamond mine, 80 km S of Borroloola, NT	55
Diatomite	Australian Diatomite Mining Pty. Ltd., 100%	Barraba open pit diatomite mine, 85 km km NNW of Tamworth, NSW	25
Dolomite	OneSteel Ltd., 100%	Ardrossan metallurgical dolomite quarry, Northern York Peninsula, SA	650
Feldspar	Minerals Corp. Ltd., 100%	Triple Chance open pit feldspar mine (includes Lady Beryl, Bakers, and Spar Ridge), 42 km SW of Broken Hill, NSW	15
Garnet	GMA Garnet Pty. Ltd., 100%	Port Gregory open pit industrial garnet mine, 100 km N of Geraldton, WA	200
Gas, condensate thousand 42-gallon barrels per day	Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]	North West Shelf gas operations, 130 km offshore from Dampier, WA	60
Gas, natural million cubic meters per day	Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]	North West Shelf gas operations, 130 km offshore from Dampier, WA	20
Gas, liquefied natural million tons	do.	Three-train liquefaction plant, Burrup Peninsula, WA	8
Gold kilograms	Gold Fields Ltd. (South Africa), 100%	Agnew open pit-underground gold mine, 23 km W of Leinster, WA	5,600
Do. do.	New Hampton Goldfields Ltd., 100%	Big Bell Consolidated open pit/underground gold mine (includes Big Bell, Black Swan, Cuddingwarra, Great Fingall, Golden Crown, and Tuckabianna): Big Bell, 30 km WNW of Cue; Cuddingwarra, 10 km WNW of Cue; Golden Crown, 7 km S of Cue, WA	7,000
Do. do.	Worsley Alumina Pty. Ltd., operator (Newmont Mining Corp., 44.45%; AngloGold Ltd., 33.33%; Newcrest Mining Ltd., 22.22%)	Boddington open pit/underground gold mine (includes Wandoo and Hedges), 150 km SE of Perth, WA 3/	12,000
Do. do.	Normandy Yandal Operations Ltd., 100%	Bronzewing underground gold mine (includes Mount McClure), 65 km NE of Leinster, WA	9,000
Do. do.	Newcrest Mining Ltd., 100%	Cadia Hill open pit gold-copper mine, 21 km SSW of Orange, NSW	11,000
Do. do.	MIM Holdings Ltd., 51%, and Westpac Banking Corp., 49%	Ernest Henry open pit copper-gold mine, 35 km NE of Cloncurry, QLD	3,000
Do. do.	Kalgoorlie Consolidated Gold Mines Pty. Ltd., 100%	Gidji Roaster gold smelter, Kalgoorlie, WA	24,250
Do. do.	Normandy NFM Ltd., 100%	Granites-Dead Bullock Soak open pit/ underground gold mine, 550 km NW of Alice Springs, in the Tanami Desert, NT	7,000
Do. do.	Placer Dome Asia Pacific Ltd., manager (Placer Dome Inc., 60%, and Delta Gold Ltd., 40%)	Granny Smith open pit gold mine (includes Sunrise and Wallaby), 20 km S of Laverton, WA	16,000
Do. do.	AuironGold Ltd., 100%	Henty underground gold-silver mine, 30 km N of Queenstown, TAS	3,700
Do. do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%	Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD	1,000
Do. do.	New England Antimony Mines NL, 100%	Hillgrove underground antimony-gold mine, 25 km E of Armidale, NSW	1,000
Do. do.	Newmont Yandal Operations Ltd., 100%	Jundee-Nimary open pit/underground gold mine, 45 km NE of Wiluna, WA	12,000

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities^{1,2}	Annual capacity^{e}
Gold--Continued:	kilograms	AuironGold Ltd., 100%	Kanowna Belle underground gold mine, 18 km NE of Kalgoorlie, WA	7,000
Do.	do.	Barrack Gold Corp., 100%	Lawlers underground gold mine, 30 km SW of Leinster, WA	3,000
Do.	do.	Sons of Gwalia Ltd., 100%	Marvel Loch Operations open pit-underground gold mines approximately 30 km SE of Southern Cross, WA	10,000
Do.	do.	Saint Barbara Mines Ltd., 100%	Meekatharra open pit mine-underground gold mine, 20 km S of Meekatharra, WA	4,000
Do.	do.	Copper Mines of Tasmania Pty. Ltd., 100%	Mount Lyell underground copper-gold mine, 2 km NE of Queenstown, TAS	1,000
Do.	do.	Harmony Gold Mining Co. Ltd., 100%	Mount Magnet open pit/underground gold mine (includes Hill 50 and Star), 2 km from Mount Magnet, WA	8,500
Do.	do.	Australian Gold Refineries, 100% (State of WA agency)	Newburn gold refinery, WA	246,000
Do.	do.	Croesus Mining NL, 100%	Norseman underground gold mine at Norseman, WA	3,700
Do.	do.	Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%	Northparkes open pit/underground copper-gold mine, 27 km N of Parkes, NSW	155,000
Do.	do.	Placer Dome Asia Pacific Ltd., 100%	Osborne underground copper-gold mine,	1,500
Do.	do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA	1,500
Do.	do.	MIM Holdings Ltd., 100%	Pacific precious metals refinery, NSW	1,900
Do.	do.	Paddington Gold Pty. Ltd., 100%	Paddington open pit gold-silver mine, 35 km NW of Kalgoorlie, WA	2,800
Do.	do.	Newmont Pajingo Pty. Ltd., 100%	Pajingo underground gold mine (includes Vera-Nancy), 60 km SSE of Charters Towers, QLD	6,400
Do.	do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	350,000
Do.	do.	Alkane Exploration Ltd., 100%	Peak Hill open pit gold mine, 50 km N of Parkes, NSW	700,000
Do.	do.	Australian Gold Refineries, 100% (State of WA agency)	Perth Refinery (Newburn), WA	95,000
Do.	do.	Homestake Mining Co., 100%	Plutonic open pit/underground gold mine, (includes Freshwater), 180 km NE of Meekatharra, WA	8,000
Do.	do.	Carpentaria Gold Pty. Ltd., 50.1%, and Haoma Mining NL, 49.9%	Ravenswood open pit mine (includes Nolans, Sarsfield, and Mount Wright), 100 km S of Townsville, QLD	3,000
Do.	do.	Newcrest Mining Ltd., 100%	Ridgeway underground gold-copper mine, 25 km S of Orange, NSW	10,800
Do.	do.	Pasminco Ltd., 100%	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	1,000
Do.	do.	Gold Fields Ltd., 100%	Saint Ives open pit/underground gold mine, 75 km SSE of Kalgoorlie, WA	15,000
Do.	do.	Selwyn Mines Ltd., 100%	Selwyn underground copper-gold mine, 150 km SE of Mount Isa, QLD	700
Do.	do.	Sons of Gwalia Ltd., 100%	Sons of Gwalia open pit/underground gold mine (includes Red October, Harlech, McGraths, Kailis, and Anchor), 5 km W of Leonora, WA	6,000
Do.	do.	MPI Gold Pty. Ltd., 50%, and Pittston Mineral Ventures of Australia Pty. Ltd., 50%	Stawell underground gold mine, 240 km W of Melbourne, VIC	3,000
Do.	do.	AngloGold Ltd., 100%	Sunrise Dam open pit mine gold (includes Cleo), 55 km S of Laverton, WA	8,000

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Gold--Continued:	kilograms	Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager (Barrick Gold Corp., 50%, and Newmont Mining Ltd., 50%)	Super Pit open pit gold mine (includes Fimiston), SE corner of the Kalgoorlie-Boulder Township, WA	20,000
Do.	do.	Otter Gold Mines Ltd., 60%, and AngloGold Ltd., 40%	Tanami open pit gold mine (includes Central Desert Joint Venture), 650 km NW of Alice Springs, NT	2,800
Do.	do.	PacMin Mining Corp., 100%	Tarmoola open pit gold mine, 29 km NW of Leonora, WA	6,500
Do.	do.	AngloGold Ltd., 100%	Union Reefs open pit gold mine, 12 km N of Pine Creek, NT	3,000
Do.	do.	Wiluna Mines Ltd., 100%	Wiluna open pit/underground gold mine, 7 km S of Wiluna, WA	3,300
Gypsum		Gypsum Resources Australia Pty. Ltd., 100%	Lake MacDonnell open pit gypsum mine, near Point Thevenard, SA	1,400
Do.		Dampier Salt Ltd., 100%	Lake MacLeod salt and gypsum solar evaporation ponds, 65 km N of Carnarvon, WA	900
Iron ore		Hamersley Iron Pty. Ltd., 60%, and China Iron and Steel Industry & Trade Group Corp. (a Chinese Government agency), 40%	Channar open pit iron ore mine, 70 km S of Tom Price, WA	11,000
Do.		BHP Billiton Ltd., 100%	Cockatoo Island open pit iron ore mine, 130 km NNE of Derby, WA	1,050
Do.		Hamersley Iron Pty. Ltd., 100%	Hamersley Operations (includes Brockman No. 2, Marandoo, Mount Tom Price, Nammuldi, Paraburdoo, and Yandicoogina open pit iron ore mines), 30 km to 85 km NE, NW, and S of Tom Price, WA	60,000
Do.		BHP Minerals Pty. Ltd., 100%	Jimblebar open pit iron ore mine, 40 km E of Newman, WA	6,000
Do.		Portman Ltd., 100%	Koolyanobbing Central open pit iron ore mine, 50 km NNE of Southern Cross, WA	3,000
Do.		BHP Iron Ore Pty. Ltd., 85%, manager; CI Minerals Australia Pty. Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%	Mount Goldsworthy open pit iron ore mine (includes Yarrie), 180 km E of Port Hedland, WA	8,000
Do.		Imdex Ltd., 100%	Mount Gould open pit iron ore mine, 160 km W of Meekatharra, WA	6,000
Do.		BHP Iron Ore Pty. Ltd.; 85% Mitsui Itochu Iron Pty. Ltd., 10%; CI Minerals Australia Pty. Ltd., 5%	Mount Newman (includes Mount Whaleback, Orebody 23-25, Orebody 29, and Orebody 30-35) open pit iron ore mines, within 13 km of Newman, WA	25,000
Do.		Robe River Iron Associates, manager (Rio Tinto Ltd., 53%; Mitsui & Co. (Australia). Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; Sumitomo Metal Australia Pty. Ltd., 3.5%)	Pannawonica (includes Mesa J) open pit iron ore mine, 130 kim SSW of Dampier WA	31,000
Do.		ABM Mining Ltd., 100%	Savage River open pit iron ore mine (includes Long Plains), 100 km SW of Burnie, TAS	2,400
Do.		OneSteel Ltd., 100%	Whyalla open pit iron ore mines, 270 km NW of Adelaide, SA	2,600
Do.		BHP Minerals Pty. Ltd., 55%; Pilbara Iron Pty. Ltd., 30%; CI Minerals Australia Pty. Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%	Yandi open pit iron ore mine, 92 km N of Newman, WA	35,000
Kaolin		Osterfield Pty. Ltd., 100%	Axedale Clays open pit kaolin mine, 18 km E of Bendigo, VIC	50
Do.		Queensland Kaolin Pty. Ltd., 96.6%, and private interests, 3.4%	Skardon River open pit kaolin mine, 85 km N of Weipa, QLD	150

See footnotes at end of table.

TABLE 2--Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Lead	Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	90
Do.	BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	265
Do.	Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	70
Do.	Pasminco Ltd., 100%	Cockle Creek lead smelter, NSW	35
Do.	do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	45
Do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	44
Do.	do.	MIM lead smelter, QLD	160
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	150
Do.	do.	Mount Isa Smelter, QLD	240
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	5
Do.	Pasminco Ltd., 100%	Port Pirie lead smelter, SA	250
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	23
Magnesite	Australian Magnesium Corp. Ltd., 100%	Kunwarara open pit magnesite mine (includes Marlborough), 70 km NW of Rockhampton, QLD	3,000
Manganese	Groote Eylandt Mining Co. Pty. Ltd., 100%	Groote Eylandt open pit manganese mine at Groote Eylandt, NT	2,400
Do.	Pilbara Manganese Pty. Ltd., 100%	Woodie Woodie open pit manganese mine (includes Bells and East Pilbara leases), 400 SE of Port Hedland, WA	350
Manganese alloys	Tasmanian Electro Metallurgical Co. Pty. Ltd., 100%	Bell Bay Smelter near Launceton, TAS	260
Mineral sands	Iluka Resources Ltd., 100%	Eneabba open pit heavy-mineral sands mine, 260 km N of Perth, WA	NA
Do.	Mineral Deposits Ltd., 100%	Hawks Nest heavy-mineral sands dredge, 50 km NE of Newcastle, NSW	NA
Do.	Cable Sands (WA) Pty. Ltd., 100%	Jangardup heavy-mineral sands dredge, 50 km S of Nannup, WA	NA
Do.	Iluka Resources Ltd., 100%	North Capel open pit heavy-mineral sands mine, 7 km N of Capel, WA	NA
Do.	Stradbroke Rutile Pty. Ltd., 100%	North Stradbroke Island heavy-mineral sands dredge, 35 km E of Brisbane, QLD	NA
Do.	KMCC Western Australia Pty. Ltd., 50%, and Ticor Resources Pty. Ltd., 50%	Tiwest Joint Venture heavy-mineral sands dredge, 180 km N of Perth, WA	NA
Do.	Murray Basin Titanium Pty. Ltd., 100%	Wemen heavy-mineral sands dredge, 80 km SE of Mildura, VIC	NA
Nickel	Outokumpu Exploration Ventures Pty. Ltd., 100%	Black Swan underground nickel mine (includes Silver Swan), 53 km NE of Kalgoorlie, WA	22
Do.	Preston Resources Ltd., 100%	Bulong open pit nickel-cobalt mine, 30 km E of Kalgoorlie, WA	9
Do.	OM Group Inc., 100%	Cawse open pit nickel-cobalt mine, 50 km NW of Kalgoorlie, WA	9
Do.	Jubilee Mines NL, 100%	Cosmos open pit nickel mine, 50 km N of Leinster, WA	80
Do.	WMC Ltd., 100%	Kalgoorlie nickel smelter, Kalgoorlie, WA	100

See footnotes at end of table.

TABLE 2--Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Nickel--Continued:	WMC Ltd., 100%	Kambalda underground nickel mines, 25 km N of Kambalda to 10 km S of Widgiemooltha, WA	35
Do.	do.	Kwinana nickel refinery, Kwinana, WA	67
Do.	do.	Leinster open pit-underground nickel mines, 10 km N of Leinster, WA	44
Do.	Mincor Resources NL, 76%; Clough Mining Pty. Ltd., 12%; and Donegal Resources Pty. Ltd., 12%	Miitel underground nickel mine (includes Redross and Mariners), 70 km S of Kambalda, WA	10
Do.	WMC Ltd., 100%	Mount Keith open pit nickel mine (includes Cliffs and Yakabindie), 70 km SSE of Wiluna, WA	50
Do.	Anaconda Nickel Ltd., 60%, and Glencore International AG, 40%	Murrin Murrin nickel refinery, Murrin Murrin, WA	45
Do.	do.	Murrin Murrin open pit nickel-cobalt mine, 60 km E of Leonora, WA	100
Do.	Australian Nickel Mines NL, 100%	Radio Hill underground nickel-cobalt mine, 100 km ESE of Karratha, WA	4
Do.	QNI Pty. Ltd., 100%	Yabulu nickel-cobalt refinery, Townsville, QLD	30
Opal	Many small producers	Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW	NA
Petroleum thousand 42-gallon barrels per day	Exxon Mobil Corp., 100%	Altona Refinery, VIC	120
Do. do.	BP Amoco Refinery (Bulwer Island) Pty. Ltd., 100%	Bulwer Island Refinery, QLD	69.3
Do. do.	Shell Refining (Australia) Pty. Ltd., 100%	Clyde Refinery, NSW	85
Do. do.	do.	Geelong Refinery, VIC	110
Do. do.	ChevronTexaco Corp., 100%	Kurnell Refinery, NSW	114
Do. do.	BP Amoco Refinery (Kwinana) Pty. Ltd., 100%	Kwinana Refinery, WA	138
Do. do.	ChevronTexaco Corp., 100%	Lytton Refinery, QLD	105.5
Do. do.	Exxon Mobil Corp., 100%	Port Stanvac Refinery, SA	69
Phosphate rock	WMC Fertilizers Ltd., 100%	Phosphate Hill-Duchess open pit phosphate mine, 140 km NW of Mount Isa, QLD	2,200
Salt	Dampier Salt Ltd., 100%	Dampier solar evaporation salt pans, 65 km N of Carnarvon, WA	5,000
Do.	do.	Lake MacLeod solar salt and gypsum evaporation pans, 65 km N of Carnarvon, WA	900
Do.	do.	Port Hedland solar salt fields, at Port Hedland, WA	3,000
Silica	Itochu Corp., 50%, and Tochu Corp., 50%	Kemerton silica sands dredge, 25 km NE of Bunbury, WA	450
Silver kilograms	Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	81,200
Do. do.	BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	700,000
Do. do.	Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	3,000
Do. do.	Pasminco Ltd., 100%	Cockle Creek silver smelter, NSW	85,000
Do. do.	do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	35,000
Do. do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	60,000
Do. do.	AuironGold Ltd., 100%	Henty underground gold-silver mine, 30 km N of Queenstown, TAS	1,100
Do. do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%	Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD	1,000

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities^{1,2}	Annual capacity^{e}
Silver--Continued: kilograms	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	375,000
Do. do.	Australian Gold Refineries, 100% (State of WA agency)	Newburn silver refinery, WA	81,000
Do. do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA	12,900
Do. do.	Paddington Gold Pty. Ltd., 100%	Paddington open pit gold-silver mine, 35 km NW of Kalgoorlie, WA	500
Do. do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	6,000
Do. do.	Pasminco Ltd., 100%	Port Pirie silver smelter, SA	450,000
Do. do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	35,000
Spodumene do.	Gwalia Consolidated Ltd., 100%	Greenbushes open pit/underground tantalite-spodumene mine, 70 km SE of Bunbury, WA	100
Steel	BHP Steel Pty. Ltd., 100%	Newcastle steelworks, NSW	1,800
Do.	do.	Port Kembla steelworks, NSW	4,000
Do.	do.	Sydney (Rooty Hill) minimill, NSW	250
Do.	do.	Whyalla steelworks, SA	1,200
Talc	Luzenac Australia Pty. Ltd., 100%	Three Springs open pit talc mine, 330 km N of Perth, WA	200
Tantalite, Ta_2O_5 pounds	Gwalia Consolidated Ltd., 100%	Greenbushes open pit/underground tantalite-spodumene mine, 70 km SE of Bunbury, WA	600,000
Do. do.	do.	Wodgina open pit tantalite mine, 100 km S of Port Hedland, WA	500,000
Tin, banch (in situ) cubic meters	Telminex NL, 100%	Ardlethan alluvial tin mine, 90 km NW of Wagga Wagga, NSW	500,000
Do.	Sons of Gwalia Ltd., 100%	Greenbushes Smelter, WA	1
Do.	Renison Bell Ltd., 100%	Renison Bell underground tin mine, 136 km S of Burnie, TAS	13
Uranium, U_3O_8 tons	Heathgate Resources Pty. Ltd., 100%	Beverley in situ leach uranium operation, 300 km NE of Port Augusta, SA	900
Do. do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA	1,500
Do. do.	Energy Resources of Australia Ltd., 100%	Ranger open pit uranium mine, 230 km E of Darwin, NT	4,500
Vanadium, V_2O_5 do.	Xstrata Windimurra Pty. Ltd., 100%	Windimurra open pit mine vanadium, 100 km ESE of Mount Magnet, WA	8
Zinc	Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	360
Do.	BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	100
Do.	Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	500
Do.	Pasminco Ltd., 100%	Cockle Creek zinc smelter, NSW	90
Do.	do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	125
Do.	Murchison Zinc Co. Pty. Ltd., 100%	Golden Grove underground zinc-copper mine (includes Gossan Hill and Scuddles), 225 km E of Geraldton, WA	150

See footnotes at end of table.

TABLE 2--Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Zinc--Continued:	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	130
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	175
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	8
Do.	Pasminco Ltd., 100%	Port Pirie zinc smelter, SA	40
Do.	do.	Ridson zinc refinery, Hobart, TAS	230
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	100
Do.	Sun Metals Corp. Pty. Ltd., 100%	Sun Metals zinc refinery, Stuart, QLD	170

[e] Estimated. NA Not available.

[1] Australian State and Territory abbreviations: NSW New South Wales; NT Northern Territory; QLD Queensland; SA South Australia; TAS Tasmania; VIC Victoria; WA Western Australia.

[2] Bearing abbreviations: N north; NNE north-northeast; NE northeast; E east; SE southeast; SSE south-southeast; S south; SSW south-southwest; SW southwest; WSW west-southwest; W west; WNW west-northwest; NW Northwest; NNW north-northwest.

[3] Care and maintenance; expansion project development decision pending.

TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2003

Commodity		Reserves
Bauxite	million metric tons	5,500
Black coal:		
In situ	billion metric tons	55
Recoverable	do.	39
Brown coal:		
In situ	do.	42
Recoverable	do.	38
Cadmium	thousand metric tons	844
Cobalt	do.	1,450
Columbium (niobium)	do.	29
Copper	million metric tons	40
Diamond:		
Gem and near gem	million carats	73
Industrial	do.	75
Gold	metric tons	5,380
Iron ore	billion metric tons	12
Lead	million metric tons	19
Lithium	thousand metric tons	167
Magnesite ($MgCO_3$)	million metric tons	344
Manganese ore	do.	124
Mineral sands:		
Ilmenite	do.	209
Rutile	do.	21
Zircon	do.	32
Nickel	do.	23
Petroleum, recoverable:		
Condensate	billion liters	282
Crude	do.	227
Liquefied petroleum gas	do.	262
Natural gas	billion cubic meters	2,220
Platinum-group metals (Pd, Pt)	metric tons	23
Rare earths (REO plus Y_2O_3)	million metric tons	1
Silver	thousand metric tons	43
Tantalum	do.	41
Tin	do.	146
Tungsten	do.	9
Uranium, recoverable	do.	675
Vanadium	do.	0
Zinc	million metric tons	35

$MgCO_3$--magnesium carbonate; REO--rare-earth oxides; Pd--palladium; Pt--platinum; Y_2O_3--yttrium oxide.

Source: Geoscience Australia, 2004, Australia's Identified Mineral Resources 2004: Canberra, Australia, Geoscience Australia, p. 9. (Modified to no more than three significant digits.)

THE MINERAL INDUSTRY OF BANGLADESH

By Chin S. Kuo

Bangladesh is one of the poorest and most densely populated countries in the world but has large potential natural gas reserves and small reserves of coal and oil. The gross domestic product (GDP) grew by an estimated 5.4% in 2003. The per capita GDP was only $368 (International Monetary Fund, 2003§[1]). The country financed its large trade deficit through foreign aid and remittances from the many Bangladeshi workers abroad. The garment industry accounted for three-quarters of the country's export earnings. Exports of natural gas could provide a major revenue source for Bangladesh if sufficient reserves were proven and developed. The development of the country's energy sector was hindered by natural disasters and inadequate infrastructure. Bangladesh was attempting to attract foreign investment in electricity, infrastructure, and natural gas (Alexander's Gas & Oil Connections, 2003§).

Bangladesh planned to privatize four state-owned petroleum marketing and distribution companies through international bidding. The companies were Eastern Lubricants Blenders, Meghna Petroleum, Padma Oil, and Standard Asiatic Oil Co. All these profit-making companies, which were 50% Government-owned on average, were subsidiaries of the state-owned Bangladesh Petroleum Corp. (World Refining, 2003).

Bangladesh could earn $600 million per year from exports of 300 billion cubic meters of natural gas through a pipeline to India during a 25-year period. Its current recoverable reserves were estimated to range from 750 billion to 900 billion cubic meters. Domestic opposition to natural gas exports to India, however, continued to grow, and the lack of other export opportunities forced ChevronTexaco Corporation of the United States to leave Bangladesh. The prospect of other foreign companies following suit could threaten to slow oil and gas exploration (Far Eastern Economic Review, 2004).

Lafarge Surma Cement Ltd., which was a joint venture of Lafarge S.A. of France and Cementos Molins, S.A. of Spain, awarded Larsen & Toubro Ltd. of India a $103.4 million contract to build a 1.2-million-metric-ton-per-year (Mt/yr) cement plant in Bangladesh. F.L. Smidth & Co. of Denmark would supply technology for the plant. The plant would be located at Chatak near Sylhet and was expected to be commissioned by October 2005. Limestone for the production of cement would be supplied from the Indian State of Meghalaya (Larsen & Toubro Ltd., 2003§).

The Sangu offshore gas pipeline underwent repair work in February that affected gas supply to Kafco, Inc. As a result, Kafco shut down its ammonia/urea units and used the downtime to carry out minor repair work at the plant. The repair work to the gas pipeline was completed within 3 weeks (Fertilizer Week, 2003). The Kafco granular plant was shut down owing to technical problems for 2 weeks in August.

The Ministry of Energy and Mineral Resources has overall responsibility for the country's energy policy and investment. Natural gas provided 67% of the country's commercial energy, and oil and limited amounts of coal and hydropower accounted for the remaining 33%. Bangladesh began its first significant coal production in April with the opening of the Barapukuria underground mine in the Dinjapur area of the Indian State of West Bengal. The mine would produce 1 Mt/yr of coal for electricity generation and was being developed by the state-owned Bangladesh Oil, Gas & Mineral Corp. (Petrobangla). The Barapukuria coal basin was estimated to contain 70 million metric tons (Mt) of recoverable coal. Another possible coal mining project at Khalashpir was under consideration (Mining Journal, 2003).

The country's natural gas production was mainly from the Chatak Field. The Government revised estimates of proven natural gas reserves in Bangladesh to 509 billion cubic meters. In addition, undiscovered reserves were estimated to be 908 billion cubic meters. Bangladesh could become a major gas producer. The country could use its natural gas to power vehicles and to produce electricity, fertilizers, and petrochemicals (Alexander's Gas & Oil Connections, 2003§).

Petrobangla had approximately 20 natural gas fields nationwide, one-half of which were active. The main fields included Bibiyana, Habiganj, Jalalabad, Kailashtilla, Rashidpur, Shahbazpur, and Titas. In addition, the Sangu offshore field in block 16 of the Bay of Bengal has produced natural gas since 1998; it was developed and run by Cairn Energy plc, Halliburton Co., and Shell Bangladesh Exploration and Development. Unocal Corp., through its wholly owned subsidiary Unocal Bangladesh Ltd., would begin development of the Moulavi Bazar Field in block 14 for deliveries of 2.83 million cubic meters per day to be used in the domestic market beginning in 2004 (Alexander's Gas & Oil Connections, 2003§).

Cairn Energy concluded the acquisition of the Royal Dutch/Shell Group's interest in the Sangu Field at yearend. The deal was worth $50 million in cash on top of royalty payments of about $25 million. With the addition of Royal Dutch/Shell's assets, Cairn Energy's average production of oil would be more than 30,000 barrels per day (bbl/d) (Rigzone.com, 2003§).

Chevron International Bangladesh, which held a 60% interest and operatorship in block 9 onshore, was sold to Niko Resources Ltd. of Canada. The other participants in block 9 were Tullow Bangladesh Ltd. (30%) and Bangladesh Petroleum Exploration & Production Co. Ltd. (10%) (Petroleum Economist, 2003b).

Bangladesh has small proven oil reserves, and Petrobangla was the sole player in the oil and gas sector. Foreign oil companies were active in exploration under production-sharing contracts in partnership with Petrobangla. Petrobangla served as the sole purchaser of oil and gas. Offshore oil exploration has been largely unsuccessful (Alexander's Gas & Oil Connections, 2003§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

The Government cancelled the production-sharing contract on block 11 that was awarded to Tullow Oil plc and Petronas Carigali in 2000. The two companies failed to gain approval or reach an understanding on substantive issues within the stipulated time. The block was handed over to Petrobangla in 2003 (Petroleum Economist, 2003a).

The country had a 33,000-bbl/d oil refinery at Chittagong. In January, the Government granted approval for price increases on retail sales of petroleum products by Bangladesh Petroleum Corp. (Alexander's Gas & Oil Connections, 2003§).

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Major Publication

Bangladesh Bureau of Statistics, Dhaka:
Monthly Statistical Bulletin of Bangladesh.
Statistical Yearbook of Bangladesh.

TABLE 1
BANGLADESH: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		1999	2000	2001	2002	2003
Cement, hydraulic[4]		2,085,000 [r, 5]	3,580,000 [r, 5]	5,005,000 [r, 5]	5,000,000 [r]	5,000,000
Clays, kaolin[4]		7,700	7,900	8,000	8,100	8,200
Gas, natural, marketed[4, 6]	million cubic meters	6,400	6,500	7,000	7,200	7,300
Iron and steel, metal:[4]						
Steel, crude (ingot only)		36,000	35,000	30,000	30,000	25,000
Steel products		90,000	90,000	80,000	80,000	70,000
Nitrogen, N content of urea, ammonia, ammonium sulfate		1,240,100 [5]	1,254,800 [5]	1,273,000 [5]	1,288,500 [5]	1,388,700 [5]
Petroleum:						
Crude	thousand 42-gallon barrels	1,400	1,500	1,550	1,600	1,800
Refinery products	do.	8,600	8,700	8,800	8,900	9,000
Salt, marine[4]		350,000	350,000	350,000	350,000	350,000
Stone, limestone[4]		27,000	28,000	30,000	32,000	34,000

[r] Revised.
[1] Estimated data are rounded to no more than three significant digits.
[2] Table includes data available through May 11, 2004.
[3] In addition to the commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, presumably are produced, but available information is inadequate to make reliable estimates of output levels.
[4] Data are for years ending June 30 of that stated.
[5] Reported figure.
[6] Gross production is not reported; the quantity vented, flared, or reinjected is believed to be negligible.

THE MINERAL INDUSTRIES OF BHUTAN AND NEPAL

By Chin S. Kuo

BHUTAN

Bhutan is a landlocked, mountainous country with an economy that is based on agriculture and forestry. Rugged terrain provides sites to harvest hydroelectric power. The country's 5-year economic plan (2002-07) placed a strong emphasis on infrastructure and energy development. In 2003, the rate of growth of the gross domestic product (GDP) was strong at 7.3%. The country remained one of the world's least developed with a per capita GDP at purchasing power parity of $741. Bhutan had a small and limited mineral industry and produced cement, coal, dolomite, ferrosilicon, gypsum, and limestone. Of the mineral output, the country exported cement, ferrosilicon, and gypsum. The Ministry of Trade and Industry is responsible for regulating the production of most mineral commodities (U.S. Department of State, 2003§[1]).

Bhutan Ferro Alloys was expected to decide on the long-delayed plan to expand the capacity of its ferrosilicon works in the eastern Himalayas by 8,000 metric tons per year (t/yr) to 9,000 t/yr through the installation of a new 12-megavoltampere furnace. The multipurpose furnace would be used to produce ferrosilicon and lesser amounts of silicon metal and value-added silicon-based alloys. The company had plans to import most of the equipment from international plant suppliers and to secure a portion of the facilities domestically. It also looked to expand into other markets outside of India (Metal Bulletin, 2003).

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Major Source of Information

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NEPAL

A ceasefire agreement in January 2003 between the Maoist rebels and the Government put Nepal back on the road to growth. The Government implemented a variety of reforms to generate jobs and stimulate investment. Reductions in agricultural production and the tourism industry brought down the rate of GDP growth to 2.3%. Agriculture contributed 38% of the GDP. The per capita GDP based on purchasing power parity was only $230, and Nepal continued to be one of the world's poorest countries. Inflation was controlled at 3% in 2003. Remittances of $90 million per year by Nepalese working in foreign countries helped the economy. Geologic surveys in Nepal found small deposits of cobalt, copper, iron, lead, limestone, magnesite, mica, and zinc. The most economically important mineral commodities produced were cement, clay, coal, limestone, magnesite, and marble (International Monetary Fund, 2003§).

Nepal launched its 10th economic development plan in 2002, and the Government began to prioritize development projects and to eliminate wasteful spending; 160 of the projects were eventually cut. A substantial amount of assistance from other countries and several multinational organizations was received. Rivers that flowed south through the Himalayas provided massive hydroelectric potential. Two privately financed hydroelectric projects were in operation—the Khimti, which had a capacity of 60 megawatts (MW), and the Bhote Koshi, which had a capacity of 36 MW. The West Seti storage project, which had a capacity of 750 MW and was dedicated to electricity exports, was promoted by an Australian company that was negotiating a power purchase agreement with Indian Power Trading Corp. (U.S. Department of State, 2004).

Reference Cited

U.S. Department of State, 2004, Nepal, Background Note: U.S. Department of State, January, p. 8.

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International Monetary Fund, 2003 (September), Nepal, World Economic Outlook Database, accessed May 19, 2004, via URL http://www.imf.org/external/pubs/ft/weo/2003/02/data/index.htm.

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[1] References that include a section mark (§) are found in the Internet Reference Cited sections.

TABLE 1
BHUTAN AND NEPAL: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity[3]		1999	2000	2001	2002	2003
BHUTAN						
Cement		150,000	150,000	160,000	160,000	160,000
Coal		68,000	67,000	65,000	65,000	66,000
Dolomite		250,000	260,000	265,000	270,000	270,000
Ferrosilicon		18,000	15,000	16,000	21,000 [r]	21,000
Gypsum		54,000	54,000	55,000	55,000	56,000
Limestone		275,000	278,000	280,000	282,000	285,000
Marble	square meters	4,000	4,000	4,000	4,000	4,000
Quartzite		52,000	52,000	53,000	53,000	54,000
Slate	square meters	9,000	9,000	9,000	9,000	9,000
Talc		3,400	3,700	3,800	3,900	3,900
NEPAL						
Cement		290,000	300,000	285,000	290,000	295,000
Clay, red		3,119 [4]	2,304 [4]	2,700	2,600	2,500
Coal:						
Bituminous		10,954 [4]	17,530 [4]	16,589 [4]	9,612 [4]	9,700
Lignite		312 [4]	52 [4]	-- [4]	-- [4]	--
Total		11,266 [4]	17,582 [4]	16,589 [4]	9,612 [4]	9,700
Gemstones:						
Quartz	kilograms	3,200 [4]	2,830 [4]	1,135 [4]	1,720 [4]	1,800
Tourmaline	do.	11 [4]	1 [4]	-- [4]	-- [4]	--
Total	do.	3,211 [4]	2,831 [4]	1,135 [4]	1,720 [4]	1,800
Lime, agricultural		24,000	19,360 [4]	15,587 [4]	20,000	17,000
Magnesia, dead-burned		26,000	1,640 [4]	-- [4]	-- [4]	--
Salt	thousand tons	1 [4]	2 [4]	5 [4]	5 [4]	5
Steel, rolled		130,000	120,000	110,000	100,000	100,000
Stone:						
Limestone		401,700 [4]	352,060 [4]	287,810 [4]	356,218 [4]	360,000
Marble:						
Chips		660 [4]	655 [4]	607 [4]	537 [4]	550
Slab, cut	square meters	704,750 [4]	79,700 [4]	54,834 [4]	46,156 [4]	45,000
Craggy	do.	2,092 [4]	1,530 [4]	1,333 [4]	2,279 [4]	2,000
Quartzite		2,700	2,800	2,800	2,800	2,900
Talc		6,157 [4]	5,852 [4]	3,923 [4]	2,621 [4]	2,500

[r] Revised. -- Zero.

[1] Includes data available through August 17, 2004.

[2] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[3] In addition to the commodities listed, crude construction materials, such as sand and gravel and a variety of stone, presumably are produced in Bhutan and Nepal, but information is inadequate to make reliable estimates of output levels.

[4] Reported figure.

THE MINERAL INDUSTRY OF BRUNEI

By John C. Wu

Brunei is a small country on the northwestern coast of Borneo Island in Southeast Asia. The country's land area is about 5,270 square kilometers, and its population was about 358,000 in 2003. Brunei's per capita income was among the highest in Asia and the Pacific region because of its rich resources of petroleum and natural gas. Brunei's per capita gross domestic product (GDP) based on purchasing power parity was estimated to be $15,407 (International Monetary Fund, 2004a§[1]). The country's proven reserves of crude petroleum and natural gas were estimated to be 1.35 billion barrels and 390.77 billion cubic meters, respectively (Oil & Gas Journal, 2003a). In addition to petroleum and natural gas, Brunei also has small resources of carbonate rocks, coal, kaolin, sand and gravel, and silica sand (Quazi, 1996, p. 1-7). In the region, Brunei ranked fourth in the production of liquefied natural gas (LNG), seventh in the production of crude petroleum, and eighth in the production of natural gas in 2003 (Oil & Gas Journal, 2003a; Alexander's Gas & Oil Connections, 2003§).

In 2003, Brunei's real GDP grew by 3.6% compared with 3.2% in 2002 owing to the increased output of oil and gas and higher Government development spending. The country's GDP, in current prices, was estimated to be $4.76 billion compared with $4.28 billion in 2002 (International Monetary Fund, 2004a§). In 2002 (the last year for which data were available), the output of oil and gas accounted for 37% of the GDP; exports of oil and gas, which were estimated to be $3.46 billion, accounted for 89% of Brunei's total export earnings ($3.87 billion); and the oil and gas industry contributed 87% of the Government's revenues (International Monetary Fund, 2004b§).

The 6 key members (Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand) of the 10-member Association of Southeast Asian Nations (ASEAN) agreed to cap tariffs on imports from within ASEAN at 5% effective January 1, 2003. These six countries, which were the first signatories to the ASEAN Free Trade Area (AFTA) agreement, had substantially achieved the aim of reducing tariffs in the region to 5% or less on almost all products under the Common Preferential Tariff (CEPT) system (BruDirect.com, 2003d§).

In November, Brunei Shell Petroleum Company Sdn. Bhd. (BSP), which was Brunei's major producer of oil and natural gas, shipped surplus lead compound and sludge from two tetra-ethyl-lead storage vessels that had been demolished at the Seria Oil Refinery to the United Kingdom. The surplus lead compound and sludge had been classified as hazardous waste that needed to be properly recovered, treated, and disposed of in a safe and environmentally approved manner. BSP's action was in response to the call made by the Government for a lead-free Brunei and supported a worldwide drive toward a lead-free environment. It was also in full compliance with the Basel Convention, which is a major international environmental protection treaty that regulates the transportation and movement of hazardous waste (BruDirect.com, 2003c§).

In September, the Brunei Economic Development Board (BEDB) and Alcoa Inc. of the United States signed a memorandum of understanding (MOU) to undertake a feasibility study on the establishment of an aluminum smelter and its associated infrastructure in Brunei. According to the BEDB, development of downstream and manufacturing industries, power supply, and infrastructure in the major industrial site of Sungai Liang was an integral part of the plans to diversify Brunei's oil- and gas-based economy and to create jobs and opportunities for its people. As a necessary condition of the study, an assessment of the environmental impact of the aluminum smelter would need to be completed before a final investment decision could be made. According to the MOU, Alcoa was to carry out the study in two phases during a 2-year period that was to begin in the fourth quarter of 2003. If the project were approved, then a smelter to produce primary aluminum would be built, which would involve foreign investment of up to $1.5 billion and would create about 1,000 jobs (BruDirect.com, 2003g§).

Brunei's mineral industry consisted of a small sector of industrial minerals and a larger sector of oil and gas. The industrial minerals sector comprised more than 20 small privately owned companies that engaged in the production and marketing of cement, construction aggregates, and sand and gravel. The cement company operated a 500,000-metric-ton-per-year (t/yr) cement-grinding plant near Muara. The plant used imported clinker and gypsum to produce portland cement and such specialty cements as oil well cement and slag cement. Cement production averaged 230,000 t/yr, or about 50% of its capacity, in the past 4 years.

The oil and gas sector comprised the following operating companies: Brunei Shell Companies, Shell New Zealand Ltd., and Total S.A. (formerly TotalFinaElf S.A.). Brunei Shell consisted of BSP, Brunei Shell Marketing Sdn. Bhd. (BSM), Brunei LNG Sdn. Bhd. (BLNG), and Brunei Shell Tankers Sdn. Bhd. (BST). BSP conducted oil and gas exploration, produced and refined crude petroleum, produced and processed natural gas, marketed crude petroleum, and traded natural gas, crude petroleum, and refined petroleum products. BSM marketed refined petroleum and petrochemical products in the domestic market. BLNG processed and marketed LNG in the overseas markets. BST transported LNG to overseas markets. Total and Shell New Zealand conducted oil and gas exploration and produced natural gas and natural gas liquid (condensate).

In 2003, a consortium of Total (60%), BHP Billiton Ltd. (25%), and Amerada Hess Corp. (15%) and a consortium of Royal Dutch/Shell Petroleum Co. (50%), ConocoPhillips Company (25%), and Mitsubishi Corp. (25%), which had been awarded offshore deepwater blocks J and K, respectively, within the Brunei's Exclusive Economic Zone (EEZ) offshore Brunei by Brunei National Petroleum Company (PetroleumBRUNEI) in early 2002, began exploring for oil and gas (Petroleum Economist, 2003).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

In January 2003, Total reported that it had made a significant natural gas and condensate discovery in its joint-venture block B, which was located about 50 kilometers offshore north of the nation's capital Bandar Seri Begawan. The joint-venture block was owned by Total (37.5%), Royal Dutch/Shell (35%), and local partners (27.5%) (BruDirect.com, 2003h§).

In June, Total announced that it had suspended exploration work in its joint-venture block J in May because of a territorial dispute between Brunei and Malaysia. The consortium that was led by Royal Dutch/Shell reportedly also was to put exploration work in its joint-venture block K on hold until the two countries' overlapping claims were resolved (BruDirect.com, 2003a§, e§).

During 2003, Brunei and Malaysia were in a maritime border dispute that began soon after Malaysia's state-owned Petroliam Nasional Bhd. signed a production-sharing contract with Murphy Oil Corp. for oil exploration blocks L and M off Sabah, Malaysia; these blocks overlapped blocks J and K. Brunei and Malaysia began discussions in mid-2003 to resolve the border issue. According to a local press report, the United Nations and the International Courts had considered asking the members of the ASEAN to act as a peace-keeping force if the conflict worsened (BruDirect.com, 2003e§, f§, i§). By yearend, the Brunei and Malaysia maritime border dispute remained unresolved.

Output of crude petroleum, which included condensate, averaged about 208,000 barrels per day. Output of natural gas was estimated to be 32.9 million cubic meters per day. In 2003, BSP produced crude petroleum, natural gas, and natural gas liquid (condensate) from 772 producing wells in 8 offshore fields (Ampa Southwest, Champion, Champion West, Enggang, Fairley, Fairley-Baram, Iron Duke, and Magpie) and two onshore fields (Rasau and Seria-Tali). Total and Shell New Zealand jointly produced natural gas and natural gas liquid from seven producing wells in the offshore Maharaja Lela Field (Oil & Gas Journal, 2003b). In 2002 (the last year for which data were available), crude petroleum was exported to Thailand (27.3%), Australia (17.3%), the Republic of Korea (16.1%), China (12.5%), Japan (12.2%), and other countries that included Indonesia, New Zealand, the Philippines, Singapore, and the United States (Petroleum Unit, 2003§).

Of the natural gas produced in 2002 (the last year for which data were available), 85% was consumed by the LNG plants for LNG production; 9%, by the domestic powerplants for electricity generation; and 6%, by the oil and gas industry. Production of LNG by BLNG at the Lumut plant in Seria was about 6.8 Mt/yr, or about 10.2 billion cubic meters per year. The production capacity of the LNG plant was 7.2 Mt/yr. The LNG plant comprised five trains, each of which was capable of processing 5.3 million cubic meters per day of gas, and three storage tanks that had a total capacity of 176,000 cubic meters. In February 2003, BLNG signed a contract with Kellogg Brown & Root International Inc. (a subsidiary of Halliburton Co. of the United States) to replace the old units with new Main Heat Cryogenic Exchange (MCHE) units. MCHE units are the largest and most sophisticated equipment in the LNG train for liquefying natural gas. BLNG placed an order for four new 100-metric-ton spiral-wound aluminum MCHE units from Linde AG of Germany in March 2002 (BruDirect.com, 2003b§).

In 2002 (the last year for which data were available), most of the LNG was exported to Japan (85.5%) and the Republic of Korea (11.6%). The major customers of the long-term contracts were Osaka Gas Co. Ltd., Tokyo Electric Power Co. Ltd., and Tokyo Gas Co. Ltd. of Japan (1993-2013) and Korea Gas Corp. of the Republic of Korea (1997-2013). In 2002, Brunei made its first spot delivery of LNG in small quantities to Spain and the United States (Poten.com, 2003§).

Brunei's economy and the mining sector will continue to be dominated by the oil and gas industry during the next 4 to 5 years. Because of the conflicts in the Middle East, the oil price in the world market is expected to increase. As a result, the export earnings from oil and gas are expected to rise, and the economy is expected to continue growing during the next 2 years. Brunei's GDP is forecast to grow by 2.0% in 2004 and 1.6% in 2005 (International Monetary Fund, 2004a§).

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TABLE 1
BRUNEI: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1999	2000	2001	2002	2003
Cement	thousand metric tons	208	232	227	241[r]	235
Gas, natural:						
Gross	million cubic meters	11,206	11,627	11,687	11,790[r]	12,702
Marketed	do.	11,627	10,751	10,967	11,120[r]	12,024
Petroleum:						
Crude[3]	thousand 42-gallon barrels	66,741	70,482	71,199	72,000[r]	75,642
Refinery products:	do.					
Gasoline	do.	1,630	1,581	1,647	1,646[r]	1,717
Kerosene	do.	--	575	579	616	634
Distillate fuel oil	do.	1,146	1,063	1,112	1,109[r]	1,195
Residual fuel oil	do.	531	475	497[r]	463[r]	511
Other[4]	do.	659	554	533[r]	626[r]	582
Total	do.	3,966	4,248[r]	4,368[r]	4,460[r]	4,639

[r] Revised. -- Zero.

[1] Table includes data available through April 30, 2004.

[2] In addition to the commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, presumably are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Includes condensate.

[4] Includes jet fuel, refinery fuel, and refinery losses.

Sources: Prime Minister's Department, Petroleum Unit and U.S. Geological Survey Minerals Questionnaire, 2000-2003.

THE MINERAL INDUSTRY OF BURMA

By Yolanda Fong-Sam

Burma is located in Southeast Asia and is bordered by the countries of Bangladesh, China, India, Laos, and Thailand; the Andaman Sea; and the Bay of Bengal. This country has an area of 678,500 square kilometers (km^2) and had an estimated population of 52.17 million in 2003 (no official census has been taken since 1983). A former colony of Great Britain, Burma achieved full independence in 1948 (U.S. Central Intelligence Agency, 2003§,[1] 2004§; U.S. Department of State, 2004§).

In 2003, Burma's gross domestic product (GDP) based on purchasing power parity was estimated to be $73 billion (International Monetary Fund, 2004§). Burma's economy is based primarily on agriculture, which included fisheries, forestry, and livestock, and accounted for nearly 54% of the GDP. The country's mineral resources include antimony, coal, copper, gemstones, lead, limestone, marble, natural gas, petroleum, precious stones, tin, tungsten, and zinc. Burma's export market totaled about $2.6 billion during 2003 and included natural gas (23.3%), forest products (14.8%), garments (14.4%), beans (about 11.7%), marine products (6.8%), and other products (27%). Imports totaled about $2.4 billion and included machinery and transport equipment (20.2%), refined mineral oil (12.3%), base metals and manufactures (9.4%), fabrics (about 8.8%), plastic (4.6%), and other products (44.7) (U.S. Department of State, 2004§).

In 2003, Burma hosted the second annual meeting of the Joint Economic Quadrangle Committee in the capital city of Yangon. The meeting, which was attended by representatives of Burma's Federation of Chambers of Commerce and Industry and the counterpart organizations from China, Laos, and Thailand, supported increased trade and investment in Burma from the neighboring countries of the Mekong region (Cambodia, China, Laos, and Thailand). The committee's proposal to attract more trade and investment to the area included the promotion of commercial navigation in the upper Mekong region, reduction of trade barriers, simplification of border-crossing procedures, and support for projects that encourage alternatives to the growing of opium. Thailand, which was the third ranked investor in Burma, invested $1.29 billion in Burma in 2002, and China, about $64 million. Burma's 2002 border trade with China was valued at $276 million, which was an increase of 35% compared with that of 2001. Trade with Thailand totaled $170 million in 2002 (Myint, 2003).

Major events in early 2003 that disrupted Burma's economy included a major banking crisis that shut down 20 private banks in the country and a Japanese freeze on new bilateral economic aid. The decline in foreign investment that had taken place since 1999 continued owing to an unfriendly business climate, political pressure from Western consumers and shareholders, and the effect of U.S. economic sanctions on the country's economy (U.S. Central Intelligence Agency, 2004§; U.S. Department of State, 2004§).

U.S. relations with Burma have been strained since 1988 when leaders of a military coup suppressed pro-democracy demonstrations and later established a military junta in place of the Government. In 2003, the U.S. Congress passed the Burma Freedom and Democracy Act (BFDA), which was signed into law by the President. The Act banned the import of Burmese products into the United States and the export of financial services from the United States to Burma, which impeded Burma's ability to obtain foreign exchange; the Act also extended visa restrictions on Burmese officials (U.S. Central Intelligence Agency, 2003§, 2004§; U.S. Department of State, 2004§).

Commodity Review

Metals

Copper.—Monywa Copper Project, which is located in west-central Burma approximately 832 kilometers (km) north of Yangon, comprises the following deposits: Kyisintaung, Letpadaung, Sabetaung, and Sabetaung South. The first phase of the Monywa Copper Project was developed as S&K Mine and consisted of the Kyisintaung, the Sabetaung, and the Sabetaung South deposits, which are adjacent to one another. The Monywa Copper Project was a joint venture between Ivanhoe Myanmar Holdings Ltd. (IMHL) [a wholly owned subsidiary of Ivanhoe Mines Ltd. (IVN) of Canada (50%)] and the state-owned Mining Enterprise No. 1. Myanmar Ivanhoe Copper Company Limited (Monywa JVCo), which was incorporated in Burma in 1996, operated the S&K open pit mine for IVN. The S&K Mine's ore-processing facilities were originally designed to produce 25,000 metric tons per year (t/yr) of London Metal Exchange (LME) Grade-A cathode copper by using heap-leach solvent extraction- electrowinning (SX-EW) technology. By 2003, the annual cathode copper production had increased to an estimated 27,900 t/yr, which was a 12% increase from the original production capacity (table 1). In late 2003, eight additional electrowinning cells were installed at the S&K Mine, which increased the production capacity to 33,000 t/yr (Ivanhoe Mines Ltd., 2004).

In early 2004, Monywa JVCo started in-fill diamond drilling at the Sabetaung deposit. The first phase of the drilling consisted of 28 holes for a total of about 1,800 meters (m). The objectives for Phase 1 drilling were to test for potential increases in ore reserves, to redefine copper grades, to develop a new resource model, and to identify potential target areas for future drilling. As of December 31, 2003, estimates of copper resources at the S&K Mine were 205 million metric tons (Mt) with an average grade of 0.37% copper, and those at Letpadaung, 1,067 Mt with an average grade of 0.39% copper (Ivanhoe Mines Ltd., 2004).

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Gold.—During 2003, the IVN Group (the combination of Ivanhoe Corporation and its subsidiaries) retained its 65% interest in the exploration concession of block 10, which is located 150 km southeast of Mandalay, and established a joint venture with the Government of Burma for the project. The joint-venture agreement gave the IVN Group the right to conduct exploration activities in the area until August 2004. Early exploration results had identified a belt of quartz gold veins south of block 10 in an area known as Modi Taung in the Nankwe District. Exploration was concentrated in six mesothermal vein systems that contain coarse visible gold. In mid-2003, results were revealed from the study of two mesothermal veins. The Shwesin vein system consisted of a thick sandstone section below the 1,150-m reference level but with dispersed mineralization. Interests were then shifted to the parallel Htongyi Taung vein system, which is located 800 m to the east of the Shwesin vein system and contains continuous but thinner veins in mudstone. The average width of the mineralized vein at the Htongyi Taung is 30 centimeters (cm) at a grade of about 30 grams per metric ton (g/t) gold (Ivanhoe Mines Ltd., 2004).

In March 2003, the IVN Group submitted a feasibility study for joint development of the Modi Taung veins to the Government of Burma. The study proposed the development of a mine in the Htongyi Taung and Shwesin vein areas with an initial production of 75 tons per day (t/d) of ore. The study proposed 11 phases, 7 of which would be at Htongyi Taung. At the time of the proposal, 35 holes had been drilled in the Modi Taung area for a total of 5,385 m (Ivanhoe Mines Ltd., 2004).

The Canadian companies Jet Gold Corp. and Leeward Capital Corp. signed a memorandum of understanding (MOU) in the first quarter of 2003 to participate in the acquisition, exploration, and development of a gold exploration block in a 700-km^2 area located in northern Shan State. The block is known as the Set Ga Done concession and is located 200 km northeast of Mandalay and 90 km from the border of Yunnan Province in China. Following exploration at the property, a feasibility study was concluded. Each of the Canadian partners will earn 40% interest in the project, and the Government of Burma, 20%. Previous work on this property indicated gold assays of up to 16 g/t gold (Jet Gold Corp., 2003§).

Mineral Fuels

Natural Gas.—According to figures released in 2002 by Burma's state-owned oil company Myanmar Oil and Gas Enterprise (MOGE), the recoverable offshore and onshore natural gas reserves in Burma totaled 51 trillion cubic feet (1.44 trillion cubic meters); additional resources of gas are estimated in the offshore Rakhine area in the Bay of Bengal to be between 13.4 trillion and 47.3 trillion cubic feet (38 billion and 1.3 trillion cubic meters) based upon seismic data. MOGE also reported annual gas production of about 282.5 billion cubic feet (8 billion cubic meters), from which nearly 176.6 billion cubic feet (5 billion cubic meters) per year were exported and earned about $500 million per year. Burma's gasfields and oilfields are concentrated in the areas of Mottama, Rakhine, and Tanintharyi (Alexander's Gas & Oil Connections, 2003b§).

In January 2003, India expressed interest in purchasing gas from Burma's block A1, which is an offshore exploration block located in northern Burma near Sittway in the State of Rakhine. Block A1 was being explored by a joint venture of Daewoo International Corporation from the Republic of Korea, which was the operator of the project (60%), ONGC Videsh Ltd. (ONGC) of India (20%), and Gas Authority of India Ltd. (GAIL) and Korea Gas (KOGAS) (10% each). In early 2003, GAIL reported that block A1 had 625 billion cubic meters of recoverable natural gas, which could sustain production for approximately 20 years. GAIL, which had expressed interest in a gas pipeline, analyzed the possibility of transporting the natural gas from block A1 by a 600-km pipeline network through Bangladesh to India. By the time GAIL announced its interests, a seismic survey had been completed in the area of block A1 (Alexander's Gas & Oil Connections, 2003a§, c§).

In early 2004, Daewoo confirmed the completion of drilling plans for block A1 with a $90 million budget for six appraisal borings and two exploration drillings. The drilling process was expected to be concluded by summer 2005. To increase natural gas exploration in Burma, Daewoo acquired a 100% interest in the new offshore block A3. Exploration programs, which included a seismic survey and exploration drilling, were expected to start in late 2004 and early 2005, respectively (Daewoo International Corporation, 2004a§, b§).

The Government of Burma granted a new natural-gas exploration contract to Thai PTT Exploration and Production Company (PTT), which was a division of PTT Public Company Ltd., to explore and develop blocks M7 and M9 in the Gulf of Moattama. The two blocks are located between the Yadana and the Yetagun commercial gasfields. The combined gas reserves of the two blocks were estimated to total approximately 5 trillion cubic feet (142 billion cubic meters). The combined gas-condensate reserves of nlocks M7 and M9 were estimated to be about 7.5 trillion cubic feet (212 billion cubic meters), which was expected to supply gas to powerplants for electricity generation and domestic use in Burma and Thailand. PPT and Burma signed an MOU to develop separation plants in Burma to process gas from the two blocks into natural gas and gas condensate (Oo, 2003b).

Premier Petroleum Myanmar (Premier), which owned a 26.7% stake in the Yetagun gas-condensate production field, pulled out from the project in late 2003. Premier's interest was sold to the remaining production-sharing license partners in the project, which increased their stakes in the production venture on a pro-rata basis according to their previous holdings, which were as follows: subsidiaries of Malaysia's Petronas Carigali Sdn. Bhd. (40.9%), Burma's MOGE (20.5%), Thailand's PTT Exploration & Production (19.3%), and Japan's Nippon Oil Co. (19.3%). The production-sharing license in the Yetagun gasfield, which is located in the Gulf of Martaban 400 km south of Yangon, covered blocks M12, M13, and M14. The project covered a total of 24,130 km^2 and produced approximately 300 million cubic feet per day (8.5 million cubic meters per day) of natural gas and from 8,000 to 9,000 bbl/d of gas condensate (Oil & Gas Journal, 2003; Alexander's Gas & Oil Connections, 2003d§).

Petroleum.—According to 2002 figures released by MOGE, offshore and onshore recoverable reserves of crude oil were estimated to be 3.2 billion barrels. Based on MOGE's data, Burma produced more than 4 million barrels per year of oil but because of shortages caused by the increased demand increasingly relied on oil imports. MOGE also reported that 19 inland oilfields in Burma were operated by foreign companies from the Bahamas, China, Cyprus, Indonesia, and the United Kingdom (Alexander's Gas & Oil Connections, 2003b§).

In early 2003, the Director General from the Ministry of Energy's Energy Planning Department stated that the state-owned refinery Thanlyin, which is located in the southeastern outskirts of Yangon, had increased gasoline production to about 240,000 gallons per day (Oo, 2003a§). The Thanlyin plant refined the gasoline from gas condensate that was extracted from the offshore Yedagon oilfield and gasfield at a production rate of 73 gallons (1.74 barrels) of gasoline for every 100 gallons (2.4 barrels) of gas condensate processed. The refinery was operated by the Ministry of Energy's Myanma Petroleum Products Enterprise (Oo, 2003a§).

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TABLE 1
BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1999	2000	2001	2002	2003[e]
METALS						
Chromium, chromite, gross weight[e]		3,200	3,000	3,000	3,000	3,000
Copper:						
Mine output, Cu content		26,736	26,711	25,800 [r]	27,500 [r]	27,900
Matte, gross weight[3]		142	125	60 [e]	100 [e]	100
Metal, refined		26,736	26,711	25,800 [r]	27,500 [r]	27,900
Gold, mine output, Au content[e, 3]	kilograms	267 [4]	250	200	200	100
Iron and steel:[e, 3]						
Pig iron		1,500	1,500	1,500	1,500	1,500
Direct-reduced iron		40,000	40,000	40,000	40,000	40,000
Steel, crude		25,000	25,000	25,000	25,000	25,000
Lead						
Mine output, Pb content[e, 5]		1,800	1,200 [3]	900 [3]	900 [r]	500
Metal:						
Refined		1,666	1,054	1,105	1,000 [e]	1,000
Antimonial lead (93% Pb)[3]		65	117	-- [e]	-- [e]	--
Manganese, mine output, Mn content[e]		50	50	50	50	50
Nickel:						
Mine output, Ni content[e]		10	10	10	10	10
Speiss (matte), gross weight[3]		77	60	40 [e]	40 [e]	40
Silver, mine output, Ag content[5]	kilograms	4,168	2,457	1,804	1,500 [e]	1,500
Tin, mine output, Sn content:[5]						
Of tin concentrate		77	149	171	170 [e]	170
Of tin-tungsten concentrate		72	63	41	40 [r, e]	40
Total		149	212	212	210 [r, e]	210
Metal, refined[e]		32 [4]	30	30	30	30
Tungsten, mine output, W content:[5]						
Of tungsten concentrate		3	1	1	-- [e]	--
Of tin-tungsten concentrate		84	73	48	30 [e]	30
Total		87	74	49	30 [e]	30
Zinc, mine output, Zn content[5]		279	437	467	500 [r]	500
INDUSTRIAL MINERALS						
Barite		24,651	30,370	31,015	18,000 [e]	20,000
Cement, hydraulic		338,025	393,355	377,961	400,000 [e]	600,000
Clays:						
Bentonite[3]		998	978	900 [e]	900 [e]	900
Fire clay and fire clay powder[3]		659	331	300 [e]	300 [e]	300
Feldspar[e, 3]		12,000	12,000	10,000	10,000	10,000
Gypsum		44,857	48,067	64,609	113,000 [e]	100,000
Nitrogen, N content of ammonia		64,782	78,000	28,000 [r]	21,000 [r]	62,500
Precious and semiprecious stones:						
Jade	kilograms	2,342,108	8,318,261	8,200,000 [r, e, 3]	10,800,000 [r, e, 3]	11,000,000
Diamond[e]	carats	5	5	5	5	5
Rubies, sapphires, spinel[3]	do.	8,970,441	8,350,695	8,630,000	4,769,511 [r]	4,700,000
Salt[e, 6]	thousand tons	35	35	35	35	35
Stone:						
Dolomite		2,523	166	4,922	3,400 [e]	3,000
Limestone, crushed and broken[e]	thousand tons	2,000	2,400	2,600	3,200	3,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite		40,309	52,811	41,736	57,000 [e]	57,000
Gas, natural:						
Gross[e]	million cubic meters	6,900 [3]	9,400 [3]	9,700	9,400	9,400
Marketed	do.	6,213 [3]	8,477 [3]	8,804	8,500 [e]	8,500

See footnotes at end of table.

TABLE 1--Continued

BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1999	2000	2001	2002	2003[e]
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	3,394	3,538	4,696	4,920 [e]	5,000
Refinery products[7]	do.	5,605	5,536	5,286	5,500 [e]	5,500

[e]Estimated. [r]Revised. -- Zero.

[1]Table includes data available through September 30, 2004.

[2]In addition to the commodities listed, construction aggregates, sand and gravel, and silica sand are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Data are for fiscal year ending March 31 of the following year.

[4]Reported figure.

[5]Data are for the production by the state-owned mining enterprises under the Ministry of Mines.

[6]Brine salt production, in metric tons, reported by the Government was 1999--61,674; 2000--69,245; 2001--61,466; 2002--60,000 (estimated); and 2003--not available.

[7]Includes diesel, distillate fuel oil, gasoline, jet fuel, kerosene, and residual fuel oil.

Sources: International Fertilizer Industry Association, Ammonia Statistics 2003; Ministry of Mines and Central Statistical Organization (Yangon), Statistical. Yearbook 2001; Myanmar Times & Business Reviews, May 2004; Selected Monthly Economic Indicators, January 2001-February 2002; Asian Mining Yearbook 2000, p. 18; World Bureau of Metal Statistics, July 2004.

THE MINERAL INDUSTRIES OF CAMBODIA AND LAOS

By John C. Wu

CAMBODIA

Cambodia, which is located north of the Gulf of Thailand, south of Laos, southeast of Thailand, and southwest of Vietnam in Southeast Asia, is a small country with a total land area of about 181,000 square kilometers (km^2). In 2003, it had a population of about 13.1 million. Cambodia was one of poorest and least developed countries in Asia and the Pacific region. Its per capita gross domestic product (GDP) based on purchasing power parity was estimated to be $1,616 (International Monetary Fund, 2004§[1]). The country's mineral resources were largely unexplored and unexploited mainly because of wars fought during the 1960s and 1980s and a lack of capital, specialists, and technology in the 1990s.

According to the Government of Cambodia, the identified mineral resources were ruby, sapphire, and zircon in the northwestern Province of Batdambang and manganese, phosphate, and salt in the central part of the country. Other mineral potential in Cambodia included bauxite, coal, natural gas, iron ore, kaolin, peat, petroleum, silica sand, slate, and tin (Asian Journal of Mining, 1999; Royal Government of Cambodia, 2003§).

To attract domestic and foreign mining companies to invest in mineral exploration and development, the Law of Minerals Management and Mining of Cambodia was promulgated by the Government on July 13, 2001. The Ministry of Industry, Mines, and Energy (MIME) was the main Government agency that implemented the law and the country's mineral policy. The Department of Geology and Mines and the Department of Energy under the MIME were responsible for developing the country's mineral resources, providing mining assistance to the private sector, and administering mining-related regulations and inspections (Asian Journal of Mining, 2000).

During the 1990s, the Government, through the MIME, issued 11 licenses, of which 5 were for gold exploration in northeastern Cambodia. Gold exploration licenses were awarded to Brewer Natural Resources Development Co. and Jupiter International Resources Cambodia of the United States; Delcom Cambodia Pte Ltd., which was a joint venture of Cambodian and Malaysian companies; Sun Trading Co. Ltd. of the Republic of Korea; and Wang Fa Cambodia Investment Group of China. In 1997, a license was awarded to Royal Phosphate Company of Malaysia to explore for phosphate rock in the Provinces of Batdambang and Kampot (Asian Journal of Mining, 1999).

No significant gold or other minerals findings were reported by any of the exploring companies or by the MIME. Production of minerals in Cambodia was limited to small-scale mining and quarrying of construction aggregates, phosphate rock, quartz sand, sand and gravel, salt, and stone. Exploration and exploitation of gemstone and gold reportedly were by local artisanal miners or small joint-venture firms. Their activity and production data were not available.

The mining sector, which was the smallest sector of the Cambodian economy, was estimated to contribute only a small fraction (about 0.2%) to the country's GDP. According to the 2001 Labor Force Survey of Cambodia, the total workforce in the mining and quarrying sector was only 4,000 compared with Cambodia's total workforce of 6.2 million (International Monetary Fund, 2003). In 2003, Cambodia's GDP grew by 4.8% compared with 5.5% in 2002. The country's GDP, in current prices, was estimated to be $4.16 billion compared with $3.99 billion in 2002 (International Monetary Fund, 2004§).

From 2000 through 2003, mining activities in Cambodia involved the production of crushed stone (construction aggregates), laterite blocks (bricks), phosphate rock, quartz sand, and sand and gravel. Gold and zircon reportedly were mined illegally in the Provinces of Kampong Cham, Mondol Kiri, and Rotanoh Kiri in 1995 (GeoJAG Australia, 2003§). Gemstones were produced at the Pailin Mine in the Province of Batdambang. Crushed stone and sandstone were produced mainly in the Kampong Speu area and in several locations between Phom Penh and Takeo. Phosphate rock was mined and processed in the Tul Meas area in the Province of Kampot or processed at a small plant in the Province of Batdambang. Quartz sand was produced in the coastal areas to the north and southeast of Sihanoukville.

Cambodia reported no proven reserves of natural gas and petroleum. Cambodia and Thailand had overlapping claims in an area of the Gulf of Thailand, which covers about 27,000-km^2; this area was thought to be rich in hydrocarbons. According to an estimate that was based on 12,000 line-kilometers of high-quality seismic data, the overlapping claims area was thought to contain about 311 billion cubic meters of natural gas reserves. The area also was thought to contain an undetermined amount of natural gas liquids and petroleum. In 2002, the Cambodia National Petroleum Authority awarded block A, which covers a 6,278-km^2 area in the overlapping claims area, to a consortium led by ChevronTexaco Corporation of the United States. During 2003, ChevronTexaco, which was the operator of block A, scheduled the drilling of at least two wells (Alexander's Gas & Oil Connections, 2002§; Cambodian Investment Board, 2003§).

In March, LG-Caltex Oil Corp., which owned and operated the second largest oil refinery in the Republic of Korea, acquired a 15% interest in exploration block A from ChevronTexaco. LG-Caltex reportedly would pay about $18 million by 2004. A preliminary study estimated that the block could contain about 400 million barrels of crude petroleum and about 85 billion cubic meters of natural gas. After the deal, ChevronTexaco's share in block A decreased to 55% from 70%. Mitsui Oil Exploration Co. Ltd. of Japan owned the remaining 30% of the block (Rigzone.com, 2003§; Webprowire.com, 2003§).

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[1] References that include a section mark (§) are found in the Internet References Cited sections.

During the next 4 to 5 years, the mining sector is expected to remain the smallest sector of the Cambodian economy unless significant reserves of oil and natural gas in block A are discovered and developed by the consortium led by ChevronTexaco. The Cambodian GDP is forecast to grow by 5.9% in 2004 and 2.5% in 2005 (International Monetary Fund, 2004§).

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LAOS

Laos, which is located north of Cambodia, southeast of Burma, south of China, northeast of Thailand, and west of Vietnam in Southeast Asia, is a small landlocked country with a land area of about 231,000 km^2. In 2003, it had a population of about 5.9 million. Laos was one of the poorest and least developed countries in Asia and the Pacific region. In 2003, Laos' per capita GDP based on purchasing power parity was estimated to be $1,787 (International Monetary Fund, 2004§).

Laos has a wide variety of minerals. The identified mineral resources were barite, clays, coal, copper, dolomite, gold, graphite, gypsum, limestone, rock salt, sapphire, silver, tin, and zinc. Other mineral potential in Laos included antimony, asbestos, bismuth, cobalt, gemstones, iron ore, lead, lignite, kaolin, manganese, molybdenum, potash, silica sand, and tungsten. Geologic environments for the discovery of coal, copper, gold, iron ore, potash, rock salt, and tin were thought to be good (Asian Journal of Mining, 2000).

The mining sector, which was dominated by the mining of gold, gypsum, limestone, and tin, was the smallest sector of the Laotian economy. The mining sector was estimated to contribute 0.6% to the country's GDP. In 2003, Laos' real GDP growth was estimated to be 5.3% compared with 5.9% in 2002 (International Monetary Fund, 2004§). According to Laos' Department of Geology & Mines, production of mineral commodities included barite, carbonate rocks (construction aggregate and limestone), coal (anthracite and lignite), gold, gypsum, rock salt, sapphire, silver, tin, and zinc. All mining activities in Laos were small scale and mostly owned and operated by state-owned mining enterprises or by joint ventures of state-owned and foreign companies.

To promote and encourage foreign investment in the mining sector, a new mining law was promulgated by the Government on April 12, 1997; fiscal incentives (tax holidays) for minerals exploration were also provided. By October 1998, 21 licenses had been issued to foreign companies—8 were for construction materials (clay, granite, gypsum, limestone, and sandstone) exploration; 5, gold; 3, coal; 2, tin; and 1 each, oil and gas, sapphire, and zinc (Asian Journal of Mining, 1999). In 2003, Oxiana Ltd. (formerly Oxiana Resources, N.L.), Padaeng Industry Public Co. Ltd., and Pan Australian Resources N.L. (PARNL) were the major foreign companies that continued to invest in exploration and development of copper, gold, silver, and zinc resources in Laos.

On February 27, 2003, Laos officially opened its first gold mine; it is located about 40 kilometers (km) north of the town of Sepon in the Province of Savannakhet in south-central Laos. In 2003, the Sepon Mine produced 1.57 million metric tons (Mt) of ore at a grade of 4.42 grams per metric ton (g/t) gold from the Discovery, Discovery West, Nalou, and Vang Ngang pits. The mill (treatment plant) processed 1.17 Mt of ore at a grade of 5 g/t gold and produced 5,140 kilograms (kg) (165,255 troy ounces) of gold and 3,850 kg (123,782 troy ounces) of silver. Gold and silver recovery rates were 87.7% and 39.0%, respectively. The cash operating cost was $4,340 per kilogram, or $135 per ounce; and production costs (cash operating cost plus depreciation, depletion, amortization, and rehabilitation), $6,848 per kilogram, or $213 per ounce in 2003 (Oxiana Resources N.L., 2003; Oxiana Ltd., 2003§).

As a result of extensive exploration and development drilling by Oxiana near the Sepon Mine, Sepon gold reserves as of December 31, 2003, increased by 70% to 14.22 Mt of ore at grades of 3.43 g/t gold and 5.68 g/t silver that contains 48.8 metric tons (t) (1.57 million troy ounces) of gold and 80.8 t (2.60 million troy ounces) of silver. Of the gold reserves, 6.83 Mt was proven at grades of 3.75 g/t gold and 5.9 g/t silver; 6.87 Mt, probable at grades of 3.11 g/t gold and 5.26 g/t silver; and 530,000 t, stockpile at grades of 3.29 g/t gold and 3.9 g/t silver.

Limited drilling at the Khanong copper deposit in the Sepon mineral district added 120,000 t of contained copper to the Khanong copper reserves. As of December 31, 2003, Sepon copper reserves increased to 15.5 Mt at a grade of 5.2% copper compared with 11.5 Mt at a grade of 5.1% copper in 2002. Of the 15.5 Mt of reserves, 11.99 Mt was proven at a grade of 5.1% copper, and 3.51 Mt was probable at a grade of 5.7% copper. The Sepon gold-copper project was owned and operated by Lane Xang Mineral Ltd. (LXML), which was owned by Oxiana Resources Laos Ltd. (a subsidiary of Oxiana) (80%) and Rio Tinto plc of the United Kingdom (20%) (Oxiana Ltd., 2003, 2003§).

Following completion of an environmental-social impact assessment study in 2001 and a bankable feasibility study in 2002 for the development of the Khanong copper project, Oxiana Ltd. awarded an engineering, procurement, and construction contract to the Khanong Development Group, which was a joint venture of engineering consultants Ausenco Ltd. and Batesman Engineering Pty Ltd., in early 2003. The €32 million solvent extraction-electrowinning (SX-EW) contract was awarded on a lump-sum basis to Outokumpu Technology Oy of Finland in May 2003. Development and construction of the copper mining project, which was adjacent to the Sepon gold mine, were scheduled to be completed in 27 months, and copper production would begin in March 2005. The Khanong copper mine would produce copper ore at the rate of 1.3 million metric tons per year (Mt/yr) that would be processed by way of a Whole of Ore Leach and SX-EW operation to produce 60,000 metric tons per year (t/yr) of copper cathodes. The $235 million project, which included the capital cost of $185 million and working capital of $30 million, would be funded initially with loans of $185 million, and the balance would be funded from equity contributions through LXML (Oxiana Ltd., 2003§).

In 2003, PARNL made substantial progress in gold and copper exploration at its property in the Phu Bia contract area, which was located about 100 km northeast of Laos' national capital Vientiane. In February, the company began a $2.3 million prefeasibility study at the Phu Bia gold project to define indicated and measured mineral resources at the Ban Houayxai and Long Chieng Track deposits. As part of the study, the company initiated a drill evaluation of the Phu Kham gold cap and the underlying the Phu Kham copper-gold deposits in the same area. The prefeasibility study was completed in September. Positive drilling results at the Ban Houayxai and the Phu Kham gold cap deposits encouraged PARNL to continue drilling at the latter. Owing to the positive results of the prefeasibility study, a full bankable feasibility study was initiated in October and was scheduled for completion by June 2004 (Pan Australian Resources N.L., 2003a, b, e).

The Phu Kham copper-gold project was estimated to contain 213 Mt of inferred mineral resources at grades of 0.6% copper and 0.3 g/t gold that contains 1.27 Mt of copper and nearly 62,200 kg (2 million troy ounces) of gold at a 0.3% copper cut-off grade. According to PARNL, the Phu Kham copper-gold deposit could be larger than expected after a recent diamond core hole intersected the western limit of the deposit and found continuous mineralization of 0.8% copper and 0.3 g/t gold for 180 meters (m) from a depth of only 30 m. PARNL raised $7 million to conduct a feasibility study, which was scheduled to be completed in about 18 months (Pan Australian Resources N.L., 2003c).

The Phu Bia gold project and the Phu Kham copper-gold projects were owned and operated by Phu Bia Mining Ltd. (PBML), which was owned by PARNL (80%) and Newmont South East Asia Pte Ltd. (Newmont SEA) (20%). In May 2003, Newmont SEA transferred 80% of its shares in PBML to PARNL. The share transfer had been approved by the Laotian Government in March 2002 (Pan Australian Resources N.L., 2003d).

Tin was produced from the Nong Sun and the Phon Thiou Mines. Mined tin ore was concentrated at the Phon Thiou plant in the Nam Pathene Valley, Province of Khammouane. All tin concentrate, which graded between 50% and 70% tin, was exported and sold to Malaysia Smelting Corp.

After signing an agreement with the Laotian Government in July 2000, Padaeng Industry Public Co., Ltd. of Thailand began mining operations at the Kaiso zinc deposit in the Vangvieng area in late 2000. All mined zinc ore was exported to Thailand for smelting and refining.

Gypsum was produced from the Dong Hene Mine in the Province of Savannakhet by the State Gypsum Mining Enterprise. Lanexang Gypsum Co. Ltd. (LGC), which had been exploring for gypsum in Laos since 1999, developed a new gypsum mine with estimated reserves of 21 Mt in the Province of Savannakhet (Reywod Manawatao, senior mining engineer, Thai Gypsum Products Pcl, oral commun., July 23, 2002). LGC was a joint venture of Thai Gypsum Products Pcl. of Thailand (70%) and the Laotian Government (30%). The country's gypsum production was estimated to be about 120,000 t in 2003. Most of Laos' gypsum production was exported to Thailand and Vietnam. About 5% of gypsum production was consumed by domestic cement plants.

Laos' first cement plant and the first Chinese-Laotian joint venture, Wanrong Cement Plant One, marketed its cement under the Golden Bull brand. The country's second cement plant, Wanrong Cement in Vang Vieng, which was located about 150 km north of Vientiane, had a capacity of 200,000 t/yr and began operation in March 2002.

The country's third Chinese-funded cement plant, which had a planned capacity of 200,000 t/yr, was under construction in the Province of Saravan. The new cement factory would be 100% owned by the Chinese investors who planned to invest about $30 million to build the plant. Under the agreement, the Chinese company had a 30-year investment contract before it was required to transfer its assets to the Government of Laos (Vientiane Times, 2002§).

In the next 4 to 5 years, the mining sector is expected to expand considerably. Oxiana is expected to increase its gold production capacity and to begin copper production at its Khanong copper mine by 2005 or 2006. Production capacities of copper and gold could be increased further if development of the Phu Kham copper-gold project by PARNL materializes by 2007 or 2008. The Loatian economy is forecast to grow by 5.8% in 2004 and 6.3% in 2005 (International Monetary Fund, 2004§).

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TABLE 1
CAMBODIA AND LAOS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		1999	2000	2001	2002	2003[e]
CAMBODIA[2]						
Cement, clinker[e]		--	--	-- [r]	-- [r]	--
Gravel		13,000 [e]	12,800 [e]	1,880 [r]	9,730 [r]	10,000
Laterite, blocks		--	29,700	42,800 [r]	-- [r]	35,000
Phosphate fertilizer		741	3,617	900 [r]	-- [r]	500
Quartz sand		1,913	17,017	5,050 [r]	-- [r]	1,000
Salt		40,000 [e]	40,000 [e]	11,000 [r]	72,500 [r]	50,000
Sand, construction materials		700,000 [e]	690,000 [e]	563,860 [r]	378,460 [r]	500,000
Stones, crude construction materials		149,800	248,100	280,740 [r]	788,100 [r]	300,000
LAOS[3]						
Barite		6,600	2,000	4,400 [r]	12,696 [r]	12,000
Cement[e]		80,000	92,000	92,000	240,000	250,000
Coal, bituminous		78,825	126,290	122,942 [r]	233,823 [r]	230,000
Gemstones	carats	126,070	189,284	-- [r]	200,000 [e]	--
Gold	kilograms	--	--	--	--	5,140
Gypsum		134,745	131,517	121,220 [r]	110,272 [r]	120,000
Limestone		66,549	221,600	287,900 [r]	1,282,900 [r]	1,300,000
Salt, rock		1,759	1,779	2,635 [r]	5,410 [r]	5,000
Silver	kilograms	--	--	--	--	3,850
Tin, mine output, Sn content		404	408	490 [r]	366 [r]	360
Zinc, mine output, Zn content[e]		--	60	28,745 [r]	1,345 [r]	1,000

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Table includes data available through May 28, 2004.

[2] In addition to the commodities listed, clay, gemstone, gold, iron ore, and lime are presumably produced, but available information is inadequate to make reliable estimates of output levels.

[3] In addition to the commodities listed, crude construction materials, such as sand and gravel, and varieties of stone are presumably produced, but available information is inadequate to make reliable estimates of output levels.

Sources: Asian Journal of Mining, Asian Mining Yearbook (11th ed.), 2000, p. 13; Cambodia's Ministry of Industry, Mines and Energy; Laos' Ministry of Industry and Handicraft; U.S. Geological Survey Minerals Questionnaires for Cambodia and Laos, 2000, 2001, and 2002; Oxiana Ltd. Annual Report 2003.

THE MINERAL INDUSTRY OF CHINA

By Pui-Kwan Tse

During the past two decades, China avoided the instability and output declines of such countries as Mongolia and Russia, that were transformed from central planning economies to market economies. This stability was attributed to the Government's ability to set and guide the gradual economic reform. Even with the outbreak of severe acute respiratory syndrome (SARS) in the second quarter of the year, China's gross domestic product (GDP) increased by 9.1% to $1.41 trillion, and the per capita GDP rose to $1,092 in 2003. Investment was the main driver for the growth. In 2003, fixed investments expanded by 26.7% to $625 billion, of which foreign direct investment accounted for $53.5 billion. Public sector investment accounted for 72.1% of total investments, which was an increase of 28.2% compared with that of 2002. The living standards of rural and urban households improved, but the income gap between these households widened. Per capita income increased by 9.0% in urban areas but by only 4.3% in rural areas. Companies in the coastal provinces experienced a shortage of skilled workers and soaring wages even as tens of millions of agricultural workers remained underemployed. The urban unemployment rate rose to 4.3% in 2003 from 4.0% in 2002. If laid-off state-owned enterprise (SOE) workers who had not been reemployed were included, then the unemployment rate would be about 8%. The Government projected that the economic growth rate was 7% in 2004, which was about 2% lower than that of 2003. The consumer price index increased by 1.2% in 2003, which reversed the deflationary trend of 2002; the increase was mainly driven by food and services. In the second half of 2003, the price of raw materials, such as aluminum, cement, and iron and steel, increased by double-digit rates, and the higher producer prices were expected to be passed on, thus pushing consumer product prices higher in 2004 (China Economic News, 2004a, b; Hong Kong and Shanghai Banking Corp. Ltd., 2004).

In 2003, despite China's enormous achievements in growth, poverty reduction, and stability, there were some shortcomings. China's air and water were heavily polluted, and grasslands, which cover about 40% of the landmass, were seriously degraded. Enterprises and related reforms were not complete. The reform of social benefits formerly provided by the SOEs, such as lifetime employment and education, health care, housing, and pensions for workers and their families, was moving very slowly to avoid social unrest. The large SOEs were disengaged from ministries, which were organized as corporations, but their governance and regulation were weak. Commercial banks were increasingly exposed to defaults on loans by the SOEs, and without further reform, the growth and stability of the financial sector may continue to be exposed to nonperforming loans (Shan, 2003).

Government Policies and Programs

The Government outlined its priorities, which included increasing rural incomes, creating jobs, developing the private sector, strengthening the rule of law, and developing more mechanisms for citizen participation and financial and SOE reforms. The economic growth by itself will not be enough to achieve sustained socioeconomic progress in the future (China Economic News, 2004a).

During the National People's Congress (NPC) in March 2003, a new administration took office, and another round of restructuring of the administration was announced. The number of ministerial-level departments under the State Council will be reduced to 28 from 29. The State Development and Reform Commission (SDRC), which had been called the State Development Planning Commission (SDPC), was responsible for short- and long-term management of the economy. The Ministry of Foreign Trade and Economic Cooperation (MOFTEC), which was in charge of foreign trade, and the State Economic and Trade Commission (SETC) were abolished. The new Ministry of Commerce (MOC) took over domestic and foreign trade issues. The integration reduced obstacles and costs of foreign companies to enter the local markets and cut bureaucratic red tape and favored domestic producers in exporting their goods or importing raw materials to be used in production. The State Assets Supervision and Management Commission (SAMC) was established to absorb the relevant functions of the SETC. The CPC Central Committee Enterprise Commission and the Ministry of Finance will focus on the management of SOEs that are under the Central Government; these exclude financial institutions and other state assets, such as land, natural resources, and public service units. The establishment of the SAMC was expected to reduce the fragmentation of the SOE supervisory function split among various agencies, to avoid problems from policy conflicts and bureaucratic infighting, and to provide the base for separating the shareholding functions from the Government in the future by centralizing the functions in one agency. The State Family Planning Commission was renamed the State Population and Family Planning Commission. The China Banking Regulatory Commission (CBRC), which was in charge of supervising banks and some nonbanking financial institutions, and the People's Bank of China (Central Bank) remained in charge of monetary policy for the country. The State Administration of Work Safety will oversee mining and production safety. The Government also abolished the State Gold Bureau and transferred its functions to the SDRC and the China Gold Association (Hong Kong and Shanghai Banking Corp. Ltd., 2003a).

The Government set banking reform as one of its top priorities. One of the conditions of full World Trade Organization (WTO) membership was to allow foreign financial institutions to participate fully in the financial system by 2006. The domestic financial system must be strengthened before a flexible exchange rate and a capital account system can be adopted. In 1998, the Government injected about $33 billion into financial institutions and transferred $169 billion in bad assets from banks to asset management companies during 1999-

2000. The Government set up three phases for each bank—bailout, corporatization, and stock market listing. In 2003, the Government used $45 billion of foreign reserves to recapitalize two state-owned banks and planned to use another $50 billion of foreign reserves to clean up the balance sheets of the other two state-owned banks in 2004 (Citigroup Global Market Inc., 2004, p. 5; Far Eastern Economic Review, 2004; Gazette of the State Council of the People's Republic of China, 2004b; PricewaterhouseCoopers International Ltd., 2004).

During the NPC meeting, the Government recognized that in the next two decades, China would face a great challenge from other developing countries such as India, Indonesia, Thailand, and Vietnam, to increase market shares in European countries and the United States. Since the 1980s, China has provided cheap and low-skill labor. The Government would like to turn its focus on the training and recruiting of professionals and specialists in various fields, which would be essential for China's further progress toward modernization. The future development will focus on knowledge and capital-intensive industries. During the past several years, foreign companies established high-tech research and development centers in China, and thousands of highly educated professionals returned to China from Australia, Canada, the United States, and Western European countries. Thousands more were willing to return to China if the economic conditions improved (Hong Kong and Shanghai Banking Corp. Ltd., 2003b).

China's investments were being directed by local governments and financed by state-owned banks. Local governments had strong political incentives to boost local economies by supporting such new investments as infrastructure projects, property development, and new industrial zones. In 2003, the Ministry of Land and Resources (MLR) froze land supply for building villas, and the Central Bank raised the required reserves ratio on commercial banks to 7% from 6% in September and was expected to increase the ratio in 2004. The Government issued a circular to commercial banks to curb credit and expansion investment in projects related to the aluminum, cement, and iron and steel sectors. The State Council raised the lending criteria for aluminum, cement, real estate, and steel projects by requiring more equity investment. The minimum equity ratio for steel increased to 40% from 25%, and that for aluminum, cement, and real estate increased to 35% from 20%. Other sectors for which investment was restricted or prohibited were machinery, petrochemicals, pharmaceuticals, printing, and textiles. Rapid investments might cause another round of commercial banks' nonperforming loan problems and would pose a threat to China's financial stability. The CBRC would penalize those who did not follow the policies. The four largest wholly state-owned banks accounted for 80% of the lending. The massive investment may also lead to more duplicate investment. Only the Central Government could approve any investment project of more than $6.0 million. The growth of the money supply, bank loans, and fixed asset investment declined in the last quarter of 2003. The Government also decided that the focus of public investment should be switched from production-related investment to education, health, science, and technology, and priority was given to rural areas rather than the coastal or urban areas (Asian Development Bank, 2004, p. 41-49; Gazette of the State Council of the People's Republic of China, 2004a).

The Government urged the NPC to amend the mineral resources law in 2003; the law was enacted in 1986 and amended in 1996. The Government believed that the changes were necessary to attract foreign investment in mineral development and production in China. The proposed changes may redefine mineral rights. In the 1986 and 1996 versions, all minerals above and under the surface belonged to and were controlled by the State. In 2000, the State Council issued a decree to allow foreign investors to establish wholly owned mining companies to prospect for and to exploit minerals in China; owing to a lack of clarity in regulations and legal definitions, however, exploration companies were reluctant to invest large amounts in China. Under the current law, prospectors have mining rights, but the law does not explain clearly how such rights can be guaranteed. In addition, local governments have been known to charge higher taxes and fees for foreign companies to explore in their jurisdictions. In 2003, the MLR established a mineral-resources law consultation committee to seek recommendations from domestic and overseas mining law experts (China Metal Bulletin, 2003).

Production

China was one of leading countries in the production of aluminum, antimony, bismuth, cement, coal, copper, fluorspar, gold, graphite, iron and steel, lead, magnesium, molybdenum, phosphate rock, rare earths, silver, talc, tin, tungsten, and zinc. The output quantity of these commodities could have significant effects on the world markets. The growth of output was expected to continue, especially for aluminum, copper, and iron and steel.

During the past several years, aluminum metal output increased sharply. About 2.8 million metric tons per year (Mt/yr) of installed output capacity was added, and aluminum metal output capacity had expanded to more than 8.3 Mt/yr at yearend 2003. According to the companies' expansion and greenfield plans submitted to the Government for approval, China will have an aluminum production capacity of about 10 Mt/yr in 2005. With the rapid increase in aluminum production, the ability of domestic output of alumina producers to meet demand will be much more difficult. In 2003, China imported about 5.6 million metric tons (Mt) of alumina, which accounted for about 50% of the total demand. The strong demand for alumina by aluminum smelters affected domestic and international market prices of alumina. The sole metallurgical-grade alumina producer in China, Aluminum Corporation of China Co. Ltd. (Chalco), increased the price of alumina several times during the year. The alumina price was expected to increase in 2004. Chinese aluminum smelters also faced electricity price increases because of power shortages in many areas of the country. Owing to high alumina prices and the shortage of electricity, about 20 smelters were forced to shut down temporarily or to close down permanently during the year. To reduce production costs, aluminum smelters formed alliances with coal/power companies to ensure receipt of preferential electricity supplies and prices. Analysts anticipated that the power supply throughout the country will tighten in 2004 and may affect aluminum production in the eastern and northwestern parts of China. In 2003, China used about 5 Mt of aluminum, and supply exceeded omestic demand. China was a net exporter of primary aluminum [492,647 metric tons (t)] (Alumina and Aluminum Monthly, 2004b).

Owing to economic expansion, the production and consumption of copper in China continued to increase. During the past 5 years, copper consumption in China increased by an average of more than 10% per year. Copper consumption increased because demand from the construction, electrical appliance, and power sectors increased. In 2003, China's copper consumption was estimated to be 3.0 Mt. As a result of increasing demand, copper prices at the Shanghai Metal Exchange rose from 16,785 yuan ($2,030) per metric ton in January to 21,608 yuan ($2,613) per ton in December. Per capita copper consumption remained low compared with other developed areas, such as Japan, the United States, and Western Europe; China's copper consumption, however, was expected to increase continuously in this decade. The output of domestic copper mines could meet only less than 45% the copper smelters' needs; therefore, China was required to import a large quantity of copper concentrates from, in order of quantity imported, Mongolia, Chile, Australia, and Peru. In 2003, China imported 3.16 Mt of copper scrap, 2.67 Mt of copper concentrates, and 1.36 Mt of refined copper. Refined copper was imported mainly from Chile, Japan, Kazakhstan, and Russia, and copper scrap was imported from Hong Kong (imported from other countries and re-exported to China), Japan, and the United States. Even though geologists have discovered several midsized copper deposits in the western part of the country, mine output was expected to remain at its 2003 level during this decade; consequently, the gap of supply and demand would become larger. In the future, China will overtake Japan as the leading copper concentrates importer in the world. If the supply of copper concentrates in the international market becomes tight, then some Chinese copper producers may be forced to shut down part of their operations. In December, China's six leading copper producers held a meeting in Shanghai and agreed to reduce production by from 10% to 15% for 2004. The reduction of output may not happen, however, because Jiangxi Copper Co. Ltd. and Jinchuan Group Ltd. expanded their copper output capacity in 2003; the reduction may be just for their production plans in 2004 and was not against their output in 2003. Because of the tightened supply of concentrates and scrap and lower treatment charge and refining charges (TC/RC) in 2004 compared with those of 2003, refined copper output was expected to increase to 1.95 Mt in 2004 (Copper and Nickel Monthly, 2004a).

Gold production continued to expand in 2003. Shandong Province was the leading gold-producing province in China followed by Henan, Shaanxi, Hebei, Fujian, and Liaoning Provinces. In the newly issued foreign investment guidelines, gold and other precious metals were moved to the category of "limited investment" from the category of "forbidden investment," which means that the Chinese gold sector was conditionally open to foreign investors. Because gold mining and processing in China used relatively low technology, advanced technology and modern management were required to improve its productivity. Of the 4,000 t of gold resources, about one-fourth required advanced technology for processing. Because of the monopoly policy, many foreign investors hesitated to participate in the Chinese gold mining sector. China ranked as the third leading gold consumption country in the world behind India and the United States. Gold consumption was expected to increase when the Government removed trade restrictions (China Gold Association, 2004).

China's iron ore production posted a slight increase in 2003. Beginning on April 1, 2002, the resource compensation tax for state-owned iron ore producers was reduced to 5 yuan ($0.60) per ton from 15 yuan ($1.81) per ton. The lower compensation tax had been available to independent iron ore producers since 1995. The reduction of the resource compensation tax helped state-owned iron ore producers invest more funds in the technical renovation of their mines and search for more iron ore resources in their mining areas that led to expanded iron ore output during the past 2 years. Because of the upgrade of ore-dressing processes in many plants, the recovery rate of iron ore fines concentrate improved. State-owned mining companies were also more willing to develop new mines. Three new mines—Beiminghe in Hebei Province, Laixin in Shandong Province, and Tianhu in the Xinjiang Uygur Autonomous Region—were put into operation. The Government expected that an additional 30 Mt of iron ore output capacity would come onstream to replace some old mines to maintain the total iron ore output at the current (2003) level during the next several years. In recent years, China has become the driving force in the international iron ore market. The world's largest iron ore producers, such as Companhia Vale do Rio Doce (CVRD), Rio Tinto plc, and BHP Billiton Limited, increased their output to meet the global demand. Iron ore imports to China were expected to increase continuously during the next several years (China Metals, 2004g).

The production of lead and zinc continued to increase in 2003. The shortage of concentrates in China forced lead and zinc producers to increase their reliance on imported raw materials. Zinc producers, such as Huludao Zinc Smelting Co., Liuzhou Zinc Products Factory, and the Zhuzhou Smelter, expressed their concerns about the shortage of concentrates. Huludao closed its No. 3 plant in July 2001 and had not reopened it. Two zinc smelters in Yunnan were closed in early 2002. In 2003, China's zinc and lead concentrates imports increased to 745,580 t and 678,996 t, respectively. The Government continued its crackdown on illegal mining activities in the Guangxi Zhuang Autonomous Region and Yunnan Province, which led to reduced supplies of lead and zinc concentrates. Owing to increased domestic demand, the metal market prices trended upward in the second half of the year. Other local producers that owned mines, however, increased their output. In 2003, the output of lead and zinc concentrates increased because the Government approved the resumption of the mining operation in Nandan, Guangxi Zhuang Autonomous Region; flooding in 2001 had closed the operation. Apparent lead and zinc consumption in China grew continuously during the past decade except in 1997. Owing to an increase in domestic demand, lead exports declined. Because of the shortage of concentrates and low

TC/RC in the international market, some Chinese lead and zinc producers could face a very difficult decision on whether to operate at loss or to shut down their smelters in the near future. In 2003, China consumed about 2 Mt of zinc and 1.1 Mt of lead (Lead, Zinc and Tin Monthly, 2004b).

Trade

China's economic reform has been underway for more than 20 years. Beginning in the 21st century, China increased its integration with the international community, and the WTO accession in 2001 accelerated the significant reform trade programs already in place. Although some barriers remain, Western countries will find it easier to enter the Chinese market. China agreed to implement tariff cuts, two-thirds of which will be implemented by 2004, and the remainder, by 2006. Tariffs will decrease to an average 9.44% in 2006 from 24.6% in 1997. The automotive, chemical, gem and jewelry, information technology products, and medical equipment sectors will be significantly affected.

The Chinese Government took steps to implement many of its specific WTO commitments. The Government reviewed 2,500 trade-related laws and regulations for WTO consistency. About 830 of these laws and regulations were repealed, and 325 were amended. Similar reviews also were taking place at the local level. The changes made by China generally were consistent with international norms in most key areas. As part of the WTO accession agreement, China committed to provide full information on the pricing mechanisms of state trading enterprises and to ensure that its import-purchasing procedures were transparent and fully in compliance with WTO rules. China agreed to phase-in full trading rights for wholly Chinese-invested enterprises and foreign-invested enterprises and individuals within a 3-year period. A relatively small number of goods, such as crude and processed petroleum and chemical fertilizers, continued to be limited to state trading with regard to the right to export.

In 2003, the Government amended the Foreign Trade Law, which had been enacted in 1994. The proposed amendments explained the implication of trade promotion and how to implement the mechanism. After becoming a member of the WTO in 2001, the Government's function shifted from managing specific enterprise operations to ensuring fair and orderly competition and protecting domestic enterprises when they faced discrimination or injury in foreign trade. Intellectual property rights, state trade, and tariff quotas were incorporated into the new version of the Foreign Trade Law (Gazette of the State Council of the People's Republic of China, 2004c).

Commodity Review

Metals

Aluminum.—The Central Government was trying to apply strict controls over the expansion of the aluminum sector, but Provincial and local governments were trying to increase employment, to promote social stability, and to reduce social payments. The State Council issued a circular to inform local governments that the Central Government would not support any new greenfield or expansion aluminum projects but would support only those projects that would replace obsolete Soderberg cells. Local governments were directed not to approve any greenfield projects without consulting the Central Government. Aluminum producers replaced most highly polluting tiny Soderberg cells with large prebaked cells. In 2003, China retired 1.04 Mt of aluminum output capacity with Soderberg cells (Alumina and Aluminum Monthly, 2004a).

Guangxi Guixi Huayin Aluminum Co. Ltd. (a joint venture among Chalco, Guangxi Investment Ltd., and Minmetals Nonferrous Metals Co. Ltd.) began to construct its 1.6-Mt/yr alumina refinery in Debao County of Bose (Baise) City, Guangxi Zhuang Autonomous Region. Initial output capacities were designed to produce 800,000 metric tons per year (t/yr) of alumina and 250,000 t/yr of aluminum in 2006. The total construction cost was estimated to be $11.4 billion (Alumina and Aluminum Monthly, 2003d).

Yixiang Aluminum Co. (a subsidiary of Yima Coal (Group) Co.) completed construction of its 100,000-t/yr alumina refinery in Mainchi, Henan Province. The first-phase construction totalled $60.5 million. The goal was to have a 600,000-t/yr-output-capacity alumina refinery by 2006; the total cost was estimated to be $266 million (China Metals, 2004a).

Alcan Inc. of Canada signed an agreement with Qingtongxia Aluminum Co. to purchase a 50% stake in Qingtongxia's 150,000-t/yr aluminum smelter and formed a joint venture. The smelter used 200-kiloampere (kA) prebaked cells and cost $209 million to construct in 2001. Alcan provided a $30 million initial fund in July for the joint venture, and Qingtongxia used the fund for technical renovation of its two other smelters that used Soderberg cells. Ningxia Power Investment Co. Ltd. also had shares in the joint venture. The joint venture started to build a 250,000-t/yr aluminum smelter and a powerplant in Qingtongxia's Phase 4 expansion. The ultimate goal of the joint venture was to have a total output capacity 650,000 t/yr of aluminum (China Metals, 2003l).

Aluminum Corporation of China (Chinalco) (the parent company of Chalco) agreed to participate in Shanxi Jinbei Aluminum Co., which was a joint venture among the Shandong Luneng Group, Shanxi Nonferrous Metals Industry Co., and the Xinzhou City government. Jinbei planned to build a 1-Mt/yr refinery in Yuanping County, Xinzhou City, Shanxi Province. The first phase of construction was a 450,000-t/yr refinery that started in October; it was expected to be completed in 2006. The refinery will use the combination process to produce alumina. Phase 1 of construction cost was estimated to be $360 million. The plan also included the construction of a 1.8-Mt/yr bauxite mine, a 300,000-t/yr aluminum smelter, and a 50,000-t/yr magnesium and alloy plant. The Yuanping area has a significant amount of bauxite reserves (217 Mt), and Shanxi Province is rich in coal reserves and accounts for one-fifth of the country's total coal output (China Metals, 2004e).

Chalco and the East Hope Group reached an agreement to form a joint venture to build a 1.05-Mt/yr alumina refinery in Henan Province. Chalco will take 30% equity in East Hope Sanmenxia Aluminum Co. Ltd., which was established by East Hope, Hunaghe Aluminum-Power Co. Ltd., and two U.S. companies, JD Metal Works Co. and Pioneer Global Investment

Co. Ltd. After Chalco acquires its shares, the shares in Huanghe will be reduced to 15% from 24%, and the shares of JD Metal and Pioneer Global will remain at 13% and 12%, respectively. East Hope planned to have first-phase construction completed in 2005; output capacity will be 700,000 t (China Metals, 2003b).

Lanzhou Aluminum Co. Ltd. and Pechiney SA of France (a subsidiary of Alcan) signed an agreement to establish Lanzhou Pechiney Project Consulting Co., in which Pechiney held a 51% interest and Lanzhou, a 49% interest. Lanzhou Aluminum Co. (Lanzhou) (the parent company of Lanzhou Aluminum Co. Ltd.) had a primary aluminum output capacity of 210,000 t/yr, of which 110,000 t/yr was Soderberg cells and 100,000 t/yr, 200-kA prebaked cells. In 2001, the Government approved Lanzhou's investment of $240 million to add a 150,000-t/yr 220-kA prebaked cell potline to replace its 80,000-t/yr Soderberg cell potline initially, but Lanzhou decided to build a 230,000-t/yr 300-kA prebaked cell potline and to transform the 80,000-t/yr Soderberg cell potline into a 100,000-t/yr prebaked cell potline. Lanzhou also planned to build a 600-megawatt powerplant, a 1-Mt/yr alumina refinery, and a carbon anode plant. The total investment was estimated to be $1.2 billion. The consulting company will acquire shares in Lanzhou's projects. Pechiney agreed to supply alumina to Lanzhou from its alumina refinery in Australia. Lanzhou planned to shut down all its Soderberg cell potlines, and Chalco planned to purchase 29% of Lanzhou's shares in 2004 (China Metals, 2003h).

After 2 years of construction, Liancheng Aluminum Co. Ltd. in Gansu Province completed its two 200-kA prebaked cell potlines, which had a total of 252 tanks and an output capacity of 135,000 t/yr in 2003; the total cost was $133 million. Together with three Soderderg cell potlines, Liancheng's aluminum metal output capacity increased to 235,000 t/yr. According to the plan approved by the Government, the company would close three Soderberg cell potlines after the 200-kA prebaked cell potlines were built. The new potlines were equipped with environmentally friendly equipment, and the power consumption per metric ton of aluminum was lower than the old ones. In 2003, Liancheng Aluminum, Shaanxi Changxin International Trade Co., the Lianyungang Port Administration, and the Lianyungang Economic and Technology Development Zone signed a letter of intent to invest $726 million jointly to build a 2.4-Mt/yr alumina refinery at Lianyungang, Jiangsu Province. Phase 1 of the plan was to build a 500,000-t/yr refinery. After completion of the first phase of construction, Liancheng and Shaanxi Changxin will invest $300 million to build a 300,000-t/yr aluminum smelter near the refinery. About 60% of China's alumina imports went through Lianyungang Port each year (Alumina and Aluminum Monthly, 2003a, c).

China's first aluminum smelter Fushun Aluminum Plant completed Phase 2 of the renovation project in 2003. The smelter replaced its Soderberg cell potline with a 200-kA prebaked cell potline. The smelter had a total output capacity of 175,000 t/yr. The smelter planned to invest $97 million to replace another 35,000-t/yr Soderberg cell potline with a prebaked cell potline. The SDRC approved the proposed renovation project. If completed, the smelter will have a total output capacity of 260,000 t/yr (Alumina and Aluminum Monthly, 2003b).

Antimony.—In 2003, China was the leading antimony producer in the world and accounted for more than 70% of the world total. The quantity of antimony output and exports from China affected the price of antimony in world markets. The Chinese Government issued guidelines to reform the antimony sector, designated three ports for antimony exports, and intended to shut down all illegal miners and producers. Export licenses and quotas were issued to credited exporters, and traders were allowed to source antimony products only from legal producers. Since the flooding in Nandan and the crackdown on illegal exports in 2001, the world market price of antimony increased to about $2,850 per metric ton at yearend 2002 from $1,100 per metric ton at yearend 2001. Because of slow economic growth in Japan, European countries, and the United States, international antimony prices were maintained in the range of $2,000 to $2,400 per ton throughout 2003. China's antimony metal production continued to decline in 2003 because the Government continued its tight control on antimony concentrates output in the Guangxi Zhuang Autonomous Region. Before 2001, mines in the Guangxi Zhuang Autonomous Region produced more than 50,000 t of antimony in concentrates; this total excluded production from illegal miners. Since then, mine output from the Guangxi Zhuang Autonomous Region decreased by more than 50%. In 2003, the Government approved the reopening of five mines in the Nandan area, and mine output from the Guangxi Zhuang Autonomous Region was expected to increase in 2004. During the past couple of years, Hunan Province replaced the Guangxi Zhuang Autonomous Region as the leading antimony-producing Province in China. Xikuangshan Twinkling Star Co. Ltd. (formerly the Xikuangshan Mine Bureau) was the leading antimony producer in Hunan Province. In 2003, China imported 22,000 t of antimony concentrates from Kazakhstan, Russia, and Tajikistan. During the past 3 years, the statistical data for antimony concentrates were questionable. Antimony output from mines was lower than that of antimony metal output. Coverage of shortage of antimony concentrates was assumed to come from the mine producers' stockpiles (Precious and Minor Metals Monthly, 2004g).

In October, the Government reduced the export rebate of antimony oxide and antimony scrap to 11% and 0%, respectively, from 13% for both in 2004. The export rebate of antimony metal remained at 13%. Owing to an increase in domestic demand, the Government reduced the export quota of antimony and its products to a total of 65,700 t in 2004 from 67,000 t in 2003. During the past several years, output and consumption of flame-retardant products increased, which led to the increased demand for antimony oxide in China. China consumed about 20,000 t/yr of antimony metal. Domestic consumption of antimony and its products was expected to increase during the next several years (Precious and Minor Metals Monthly, 2003b).

Cobalt.—The demand for cobalt in China had increased sharply during the past several years. China's largest cobalt producer, Jinchuan Nonferrous Metals Corp., planned to expand its refined cobalt output to 2,000 t in 2004 and started construction of an additional 2,000-t/yr cobalt-smelting facility in 2003. Jinchuan completed the construction of its 400-t/yr highly purified electrolytic cobalt plant in 2003, and trial runs were scheduled to start at yearend 2003. During the past several years, several secondary cobalt smelters were being built in Shanghai and the Provinces of Hainan, Liaoning, and Zhejiang. Cobalt was recovered as byproduct from nickel and copper mines in the Provinces of Gansu, Hebei, Qinghai, Sichuan, and Xinjiang. In 2003, China imported 83,468 t of cobalt concentrates from the Republic of the Congo and Cuba. The consumption of cobalt was about 8,600 t of metal (Precious and Minor Metals Monthly, 2004a).

Copper.—In 2003, Glencore International AG stockpiled up to 30,000 t of copper concentrates in its warehouse in Nanjing, Jiangsu Province, and tried to sell them to smelters at a low TC/RC rate. Owing to the decline in availability of domestic concentrates, China's six largest copper producers (Baiyin Nonferrous Metals Co. Ltd., Daye Nonferrous Metals Co., Jiangxi Copper Company Limited, Luoyang Copper Processing Factory, Tongling Nonferrous Metals Co., and Yunnan Copper Co.) agreed to form an alliance to purchase copper concentrate on the international market. The alliance set up a coordination team in Shanghai to share trade information. These six copper producers accounted for about 75% of China's total copper concentrate imports (China Metals, 2003c).

At yearend 2003, the refined copper output capacity of the Guixi Smelter (a subsidiary of Jiangxi Copper) increased to 400,000 t/yr from 200,000 t/yr. With the installation of a 100,000-t/yr converter, the output capacities of sulfuric acid, silver, and gold will increase to 1.03 Mt/yr, 158 t/yr, and 7.8 t/yr, respectively. The company produced 343,000 t of copper in 2003 compared with 231,000 t in 2002. The company also upgraded the ore output capacity to 100,000 metric tons per day (t/d) at its Dexing Mine. The ore output capacity of its newly acquired Wushan Mine increased to 3,000 t/d. The expansion project at Fujiawu Mine was expected to be completed in April 2004 and will increase the dressing capacity to 15,000 t/d. The company produced about 50% of raw materials from its mines and sourced the remaining raw materials from domestic and international markets. The imbalance in the supply of and demand for copper in Chinese and overseas markets might have some impact on the company's metal production plan. The company also decided to expand its downstream production capacity. Construction of a 150,000-t/yr copper rod mill was completed in 2003. The company signed an agreement with Yates Foil Co. of the United States to invest $70 million to build a 6,000-t/yr electrolytic copper foil mill in Nanchang, Jiangxi Province; the construction began in September and was scheduled to be completed within 18 months. The copper foil will be used mainly in printed circuit boards. The joint-venture equity was 60-40 between Jiangxi Copper and Yates (China Metals, 2003e).

Jiangxi Copper acquired a 40% share of Kangxi Copper Co. Ltd. in Xichang, Sichuan Province. Kangxi Copper had output capacity of 18,000 t/yr of copper anode, 20 t/yr of silver, and 100 kilograms per year (kg/yr) of gold. Jiangxi Copper planned to establish its exploration and production base in the Provinces of Sichuan and Yunnan, which have a high potential for mineral resources. Jiangxi Copper also acquired a 46% share of Diaoquan Silver-Copper Mining Co. in Datong, Shanxi Province (Copper and Nickel Monthly, 2003b).

Shanghai Xinfengneng Industrial Co. Ltd. began the construction of its solvent extraction-electrowinning (SX-EW) project in Hami, Xinjiang Uygur Autonomous Region. In 2001, Xinfengneng acquired the exploration and mining rights for the Tuwu-Yandong copper deposit, which covers an area of 7.97 square kilometers (km^2) in the Tianshan region. After 2 years of prospecting and planning, the company decided to build a hydrometallurgical plant at its No. 2 ore body at the Tuwu prospect, which had 100 Mt of ore reserves with an average grade of 0.65% copper. The company estimated that 6 Mt of copper was contained in the resources of the Tuwu-Yandong deposit. Construction of the plant would be carried out in three phases. The company planned to produce 6,000 t/yr of copper in 2004, 30,000 t/yr in 2006, and 50,000 t/yr in 2007. The total investment was estimated to be $121 million. After the completion of Phase 1 of construction, Xinfengneng could overtake Zhongtiaoshan Nonferrous Metals Co., which produced 2,000 t/yr of copper from its SX-EW plant, to become the largest hydrometallurgical plant in China (Copper and Nickel Monthly, 2003a).

Baotou Huading Copper Development Co. Ltd. started construction of its copper smelter in Baotou, Nei Mongol Autonomous Region. The smelter was designed to produce 800,000 t/yr of sulfuric acid and 200,000 t/yr of blister copper. The construction plan was divided into three phases. In the first phase, which was scheduled to be completed in November 2004, the smelter would produce 115,000 t/yr of sulfuric acid and 30,000 t/yr of blister copper. The second phase will expand copper output capacity to 100,000 t/yr and sulfuric acid output capacity to 400,000 t/yr. The implementation of the construction plan will depend on the development of the Oyu Tolgoi (Turquoise Hill) copper deposit in Mongolia (Copper and Nickel Monthly, 2003c).

In July, China Nonferrous Engineering and Research Institute, China Nonferrous Metal Industry Construction Group Co. Ltd., and Ivanhoe Mine Ltd. of Canada signed a cooperation agreement to develop the Oyu Tolgoi copper deposit. The Chinese partners will perform premining prospecting in the area and may participate in mining and exporting copper concentrates to China (China Metals, 2003f).

Yunnan Copper Group Co. Ltd. planned to increase its output capacity to 350,000 t/yr of refined copper, 50,000 t/yr of electrolytic zinc, 400 t/yr of silver, and 5 t/yr of gold by 2005. The shortage of copper concentrates was expected to be a major obstacle for the expansion plan. The company had five copper mines (Dahongshan, Dayao, Dongchuan, Mouding, and Yimen) in Yunnan Province. Because of exhausted copper resources, Yunnan Copper closed down the Dongchuan and the Mouding Mines 3 years ago and planned to close down the Dayao and the Yimen Mines because of exhausted copper resources within the next 4 years. The Dahongshan Mine in Yimen, which was put into operation in July, was designed to produce 12,000 t/yr of copper in concentrates and 159,000 t/yr of iron ore. The expansion of the Lala Mine in Sichuan Province, which was owned by Yunnan Copper and others, was completed in September, and output capacity increased to 11,400 t/yr of copper in concentrates. To replace its exhausted mines, Yunnan Copper signed agreements with three local companies in Diqing, Yunnan Province. The Pulong Mine had estimated resources of 2 Mt of contained copper. Yunnan Copper acquired major shares in Yunnan Diqing Nonferrous Metal Co. Ltd., and Diqing Investment Co., Yunnan Huaxi Mining Resource Co., and Yunnan Mining Resource Co. became minor shareholders in the Pulong Mine. Yunnan Copper also acquired the exploration license for the Yangla Mine from Yunnan Diqing Tibetan Prefecture. Yunnan Copper planned to invest $362 million in developing the mineral resources in Diqing (China Metals, 2004h).

Tongling Nonferrous Metals Co. planned to invest $1.54 billion to expand its copper cathode output capacity to 450,000 t/yr from 310,000 t/yr within the next 3 years. Its subsidiary Tongdu Copper Holding Co. Ltd. had two copper plants—Jinchang Smelter in Tongling, Anhui Province, and Zhangjiagang United Copper Co. in Zhangjiagang, Jiangsu Province. The two smelters had a total output capacity of 180,000 t/yr, and Tongling's joint-venture company Jinlong Smelter in Tongling had an output capacity of 130,000 t/yr (Copper and Nickel Monthly, 2004c).

Gold, Silver, and Platinum-Group Metals.—Before 2002, China's gold market was controlled by the Government, which required that all mined and smelted gold output be sold to the People's Bank of China (PBC) at a fixed price. In 2001, the Government decided to establish a gold exchange in Shanghai and began trial runs on November 28. On October 30, 2002, the Exchange was put into full operation. The Shanghai Gold Exchange's 108 members included producers/consumers, traders, and commercial banks; membership was not open to foreign-funded companies.

The Ministry of Finance and the State Administration of Taxation agreed that all gold bullion traded on the Shanghai Gold Exchange would be value-added tax (VAT) free if not delivered. A VAT would be applied on delivered gold bars, but dealers would be able to receive an immediate refund of the tax. The 17% VAT resulted in inactivity on the China Silver Exchange, which opened in 2000, and the Shanghai Diamond Exchange until the change in taxation policy in May 2002.

In August 2003, the Government allowed platinum trade at the Shanghai Gold Exchange. Zhongbo-Shijin Science and Trade Co. Ltd. was the sole authorized platinum importer in China. Platinum transactions on the Shanghai Gold Exchange were exempt from the 17% VAT. In 2003, China imported 8,102 t of platinum mainly from Russia and South Africa.

In 2003, the Government approved the Shanghai Gold Exchange to conduct settlement with "T+5" [a gold spot trade can be made within 5 working days] in 2004, which indicated that futures trades of gold may be introduced in the near future. The Bank of China, the China Construction Bank, and the Industrial and Commercial Bank of China were members of the Shanghai Gold Exchange, and the Government allowed them to import and export gold and to hedge on overseas gold exchanges. The PBC retreated from the gold market completely at yearend 2002 and became a monetary bank.

The Government also allowed foreign companies to participate in domestic gold jewelry production, under the condition that the companies purchase local raw materials, and to engage in investment, processing, wholesale, and retailing in China. The Government hoped this new policy would encourage more foreign companies to set up joint ventures and would ease the short supply of gold for jewelry in China (Precious and Minor Metals Monthly, 2004e).

The production of silver was from silver mines and associated production of copper, gold, lead, and zinc mines. Associated mines accounted for 80% of total output. During the past several years, China's mined silver output increased to more than 2,400 t in 2003 from less than 1,000 t in the 1990s. China's major silver producers were the Baojiapuzi Mine in Liaoning Province, the Fankou and the Pangxidong Mines (Lianjing Mine) in Guangdong Province, the Fengning Niuquan Mine in Hebei Province, the Hujiajian Mine in Jiangxi Province, the Poshan Mine (Tongbai Mine) in Henan Province, the Jiawula and Chaganbulage Mines in the Nei Mongol Autonomous Region, the Yinkengshan Mine in Zhejiang Province, and the Yintongzi Mine (Shaanxi Mine) in Shaanxi Province. In 2003, China produced more than 3,500 t of silver from domestic and imported ores and consumed about 2,000 t of silver. China's silver production and consumption were expected to increase in the future. Electronics accounted for 45% of the total consumption followed by jewelry, 14%; photosensitive material, 13%; coins, 6%; and others, 22%. In 2003, China exported 2,891 t of unwrought silver, and the Government increased the silver export quota to 3,050 t in 2004. The Government authorized 29 silver producers and traders to export silver (China Precious Metals, 2003; China Metal Bulletin, 2004e; Precious and Minor Metals Monthly, 2004b).

Sino Gold Mining Ltd. of Australia, which was the only foreign gold producer, operated the Jianchaling Mine in Shaanxi Province. Sino Guizhou Jinfeng Mining Ltd. (a subsidiary of Sino Gold) continued its exploration at the Jinfeng gold prospect in Niluo village, which is located 34 kilometers (km) southeast of Mingu township, Zhefeng County, Qianxinan Prefecture, Guizhou Province. The deposit is located in a large region of gold mineralization known as the Golden Triangle. Drilling intersected substantial mineralization in the footwall and hangingwall of the main deposit. Based on drilling results, the company estimated the resource to be 14 Mt at 5.8 g/t at a cutoff grade of 2 g/t. The bankable feasibility study was scheduled to be completed in 2004. Sino Gold had an 85% interest in Jinfeng Sino Gold Ltd. and also owned 51% of the joint-venture company Sino Mining Jinkang Ltd., which held exploration rights over a 233-km^2 area in the north-central part of Sichuan Province; the joint-venture partner was the Deyang Geochemical Group (the subsidiary of the Sichuan Provincial Bureau of Geology and Mineral Resources). Sino Gold had the right to earn a 75% interest in the property and the exclusive rights on any discoveries within a further 2,778-km^2 area that surrounds the project with a minimum expenditure of $300,000 during the first 18 months. Exploration work focused on the Bachelor, the Milk Wood, the Pine Forest, the Seven Tree, and the Tanglong prospects. The site was operated by a local exploration group. Sino Gold also signed an agreement to acquire an initial 80% interest and exploration license in the White Mountain (former Banmiaozi) gold prospect in Jilin Province; the prospect is located 230 km southeast of Changchun. During previous exploration work, which included underground aditing and surface trenching, a 28-m regional fault structure with 5.1 g/t gold had been discovered. Sino Gold also prepared to sign a letter of intent to explore in northern Shandong Province (Sino Gold Ltd., 2003).

The Yunnan Provincial Government approved the formation of the joint-venture Yunnan Jin-Chang-Jiang Mining Co. Ltd. by SKN Resources Ltd. of Canada and Kunming Gold Exploration Engineering Co. Ltd. (KGEE); the joint venture would explore the Tuobuka project. SKN held an 80% interest in the joint venture, and KGEE had a 20% interest by contributing the mineral rights and the exploration permit. The exploration permit covered a 24.62-km^2 area about 110 km north of Kunming, Yunnan Province. The exploration work included a detailed survey and sampling of the mining tunnels. The drilling program will be carried out in 2004 (SKN Resources Ltd., 2003).

Indium.—China was one of the major indium-producing countries in the world. Indium was recovered as byproduct of zinc operations. Electronics was the main consuming sector. In 2000, China produced about 200 t of indium. Since the Government cracked down on illegal mining in Nandan in 2001, the supply of indium-associated ore from the Guangxi area was reduced sharply, which forced Laibin Huaxi Indium and Zinc Smelter and the Zhuzhou Smelter to shut down part of their operations. In 2003, the Government allowed five mines in Nandan to resume operations; only two contained indium. Mengzi Mining and Metallurgy Co. Ltd. in Mengzi, Yunnan Province, submitted a feasibility study to recover indium from its Bainiuchang Mine and to build a 50-t/yr smelter for Government approval. The mine had 1,000 t of indium reserves (China Metal Bulletin, 2004a, b).

Iron and Steel.—The continuous expansion in the iron and steel sector was mainly generated by strong domestic demand. The demand for steel products from such sectors as automobile, infrastructure, real estate, and shipbuilding has increased rapidly during the past several years. Steel producers were not only expanding iron and steel output in their old facilities, but also building new plants in other locations. Coastal areas were target places for expansion because they have easy access to ore imports. Because of environmental concerns and the 2008 Beijing Olympic Games, the Central and Beijing Governments urged Shoudu Iron and Steel (Group) Co. (Shougang) to reduce its output capacity in Shijingshan, Beijing, and to move production facilities to Hebei Province. Shougang reduced its crude steel output capacity by 2 Mt/yr during the past 2 years and relocated its coking and sintering facilities to Qian'an, Hebei Province. The company planned to build a 4.5-Mt/yr steel production facility in Qian'an, and the first-phase construction of 2-Mt/yr steel output capacity was scheduled to be completed in mid-2004. Shougang also planned a greenfield iron and steel facility in Caofeidian, Hebei Province; its initial output capacity should be 5 Mt/yr. Caofeidian is located near Jingtang Port where the Government approved the construction of a 200,000-deadweight-ton iron ore berth. Shougang intended to shut down its crude steel production facility at Shijingshan by 2012 (China Metals, 2003g).

Several iron mines were either under construction or being expanded in 2003. Phase 2 of construction of the Dahongshan Mine, which is located in Yuxi, Yunnan Province, was underway. The Kunming Steel Group planned to expand the iron-ore-dressing capacity of the mine to 4 Mt/yr from 500,000 t/yr. The Wuhan Iron and Steel Group proposed the expansion of the Jinshandian Mine mining and dressing capacities to 3 Mt/yr from 1.5 Mt/yr by 2006. Panzhihua Iron and Steel Co. began the construction of the Baima Mine in Baima, Sichuan Province. The first phase of construction was scheduled for completion in 2006. The designed mining and dressing capacity of the mine was 6.5 Mt/yr, and designed production of iron ore pellets was 2.34 Mt/yr. The construction of Shougang's Mengjiagou Mine in Qian'an was underway. After completion, the mine will have an output capacity of 6 Mt/yr of iron ore. Jiuquan Iron and Steel Co. planned to develop its Heigou Mine in the Jingtieshan iron deposit in Jingtieshan, Gansu Province. The first-phase mining and dressing capacity was 2 Mt/yr and was scheduled to be completed in 2006. The plan for the second phase will expand the mining and dressing capacity to 6 Mt/yr in 2010. Yingliu Mining Co. Ltd. planned to develop its Caolou Mine in Anhui Province. The designed mining capacity was 1.5 Mt/yr (China Metals, 2004g).

In 2003, the Government considered the iron and steel sector to be one of the "overheated sectors" and restricted output capacity expansion. Steel production was expected to reach 250 Mt in 2004. It appeared that the "macrocontrol" policies affected smaller and private steel producers. Large state-owned steel producers continued to expand, but small and private steel producers were forced to shut down their operations because of a credit crackdown, high raw material prices, and a shortage of power. Large state-owned steel producers were less affected by higher raw material prices and shortages of power because they had preferential power prices and long-term supplies of raw materials. Without approval from provincial bank officials, local commercial bank officials were not allowed to issue any loans. Local governments also were reluctant to help small and private steel producers obtain bank loans. The macrocontrol policies were part of the Government's strategy to promote higher value-added steel products. Each year, China imported large quantities of high-value-added steel products from Japan, the Republic of Korea, and Taiwan to meet its demand (China Metal Bulletin, 2004c).

Hangzhou Iron and Steel Co. Ltd. (the subsidiary of the Hangzhou Iron and Steel Group) planned to expand its steel output capacity to 4 Mt/yr by 2007 to meet local demand. In Zhejiang Province, steel consumption was about 10 Mt/yr, but Provincial steel producers produced about 3.2 Mt/yr, and the gap was met by shipments from other Provinces. During the past couple of years, the subsidiary invested $60 million each year for technology renovations of its facility that produced value-added steel products. The Hangzhou Group planned to build a greenfield steel plant that would produce flat products in Ningbo, Zhejiang Province. The proposed plan was submitted to the Government for approval (China Metals, 2004f).

BHP Billiton Inc. and four Chinese steel producers, Maanshan Iron and Steel Co., Shagang Group, Tangshan Iron and Steel Co., and Wuhan Iron and Steel Group Co., signed an agreement to form the Wheelarra Joint Venture. The joint venture will expand BHP Billiton's Jimblebar Mine, which is located near Newman, Western Australia. BHP Billiton had a 51% interest; the four Chinese steel producers each held a 10% interest, and two Japanese companies, Itochu Minerals Australia and Mitsui Corp., held 4.8% and 4.2%, respectively. The joint venture will supply 12 Mt/yr of iron ore for 25 years to Chinese steel producers. The average iron content of the ore was 61.5%. Tangshan and Wuhan will receive 3.5 Mt/yr each, and Maanshan and Shagang will get 2.5 Mt/yr each (China Metals, 2004b).

In June, Shaoguan Iron and Steel Co. completed its 19-month 2.37-Mt/yr expansion project. The company's total steel output capacity increased to 4 Mt/yr. Two 120-t converters, two 120-t vacuum degassing furnaces, two stab casters, and a five-strand billet caster were added to the facility. The company planned to phase out its four 15-t converters and 90-t electric arc furnace (China Metals, 2003i).

The Guangzhou Iron and Steel Group and JFE Steel of Japan agreed to establish the joint venture Guangzhou JFE Steel Sheet Co. Ltd. to build galvanizing lines in Nanshan, which is located 60 km south of Guangzhou, Guandong Province. The sheet will be from 0.3 to 2.3 millimeters (mm) thick and from 800 to 1,700 mm wide and will be used for automobiles and home appliances. Construction of the plant was scheduled to begin in early 2004 and to be completed in 2005. The total investment was estimated to be $160 million. Guangzhou planned to build a 10-Mt/yr iron and steel plant in Nanshan. In the Guangdong area, steel demand exceeded supply, and about 7 Mt/yr of steel products was imported from other provinces (China Metals, 2003d).

Lead and Zinc.—Jinshi Mining Co. Ltd. in Hunan Province signed an agreement with West Mining Co. Ltd. in Qinghai Province for a 50,000-t/yr zinc metal expansion project in the Ganheyuan Industry Park. Cost of the expansion project was estimated to be $31.4 million. After completion of the expansion in 2004, the zinc smelter will have an output capacity of 80,000 t/yr. West Mining was the largest lead and zinc mining company in the western part of China and produced about 100,000 t of lead and zinc in concentrates (China Metals, 2003k).

The Lanping Mine was the largest lead and zinc mine in China. In the 1990s, China Nonferrous Metals Industry Corp. tried to develop it, but the company was unable to remove all illegal miners. Billiton Inc. signed an agreement with the Yunnan Provincial Government to develop the mine in the late 1990s. After more than a year of negotiation, Billiton decided not to pursue the project. Sino Mining also expressed an interest in developing the mine. In the early 2000s, Yunnan Lanping Nonferrous Metal Co. was established from the merger of four local dressing plants and smelters. Province-owned Yunnan Metallurgical Group Corp. held the majority share of the company. In 2003, with the approval of the Yunnan Government, Sichuan Hongda Group Co. from Sichuan Province invested $36.2 million in Yunnan Lanping and renamed it Yunnan Jinding Zinc Co. Ltd. (Jinding). Sichuan Hongda held a 60% interest (Sichuan Hongda Chemical Co. Ltd., 51% and Sichuan Hongda (Group) Co. Ltd., 9%), and the remainder was held by Yunnan Metallurgical, the Lanping County Financial Bureau, Nujiang State Asset Management Co. Ltd., and Yunnan Copper. Jinding planned to invest about $363 million to develop the mine and to build a 200,000-t/yr smelter. Phase 1 of construction was scheduled to begin in 2003 and was expected to be completed in 2005. The initial design output capacity was 100,000 t/yr of zinc metal (Lead, Zinc, and Tin Monthly, 2003d).

Baiyin Nonferrous completed a technical renovation of its Northwest China Lead-Zinc Smelter in 2003. The arrester rate was improved to 99%, and the recovery rate of metal increased by 0.3%. The company produced 79,000 t of zinc and 11,000 t of lead, and the output was expected to increase to 140,000 t of zinc and 15,000 t of lead in 2004. Huludao Zinc Smelting Co. planned to restart its No. 3 zinc smelter, which had an output capacity of 130,000 t in 2004 (Lead, Zinc, and Tin Monthly, 2003a).

In December 2002, Shuikoushan Nonferrous Metals Co. Ltd. began construction of a 80,000-t/yr lead smelter. The $41.1 million smelter was financed by bank loans (50%) on which the Government would pay the interest for the first 2 years and state bonds (20%). The smelter, which was scheduled to be completed by yearend 2004, would replace Shuikoushan's old 60,000-t/yr smelter. The new smelter was designed to recover 96% of the emission gases that would produce 80,000 t/yr of sulfuric acid. The old smelter was not equipped with a gas recovery system (China Metals, 2003j).

Magnesium.—China overtook the United States to become the leading magnesium-metal-producing country in the world. Its output accounted for more than 50% of the world total. China's primary magnesium metal was produced mainly by the silicothermic, or Pidgeon, process; dolomite and ferrosilicon are the raw materials used. The process was considered to be obsolete by Western standards.

During the past several years, China's magnesium sector changed dramatically. In the 1990s, plants that produced about 5,000 t/yr were considered to be large, and more than 400 magnesium producers had a total output capacity of more than 200,000 t/yr. Through merger and careful modifications, new plants were being built with less capital and increased output. About 150 magnesium producers had a total output capacity of about 600,000 t/yr at yearend 2003. Magnesium producers in Shanxi Province accounted for 76% of the total output capacity; Ningxia Province, 11%; Shaanxi Province, 4%; and others, 9%. The country consumed about 52,000 t of magnesium metal from such sectors as aluminum alloys, die-casting magnesium alloys, desulfurizing agents in steelmaking, rare-earth alloys, and reducing agents in metal production. Magnesium consumption was expected to increase to 100,000 t in 2010. During the past several years, magnesium exports from China increased sharply. In 2003, China exported more than 80% of its total output. The Government urged magnesium producers to develop more downstream magnesium products for such sectors as automobiles, aerospace, and electronics (Precious and Minor Metals Monthly, 2004f).

Yuxing Hongfu Magnesium Co. Ltd. and Hong Kong-based Xuxing Science and Technology Co. formed the joint venture Xixian Yuxing Hongfu Magnesium Industry Co. Ltd. to build a 50,000-t/yr magnesium plant in Xixian County, Shanxi Province. Phase 1 of construction of 10,000 t/yr was scheduled to be completed in October 2003; Phase 2 of construction of

20,000-t/yr was scheduled to be completed by August 2004; and the final 20,000 t/yr was planned to be finished in 2005. The joint venture planned to apply for a listing on the stock exchanges in Hong Kong and Shanghai. Yuxing Hongfu had a magnesium metal output capacity of 6,000 t/yr (Precious and Minor Metals Monthly, 2003c).

Molybdenum.—Luoyang Luanchuan Molybdenum Industry Group Co., Ltd. completed construction of its dressing plant in 2003. The $1.1 million expansion project would increase the daily dressing capacity to 6,000 t from 1,500 t and was expected to increase molybdenum concentrates output capacity to 13,000 t/yr. The company had successfully developed a 0.61-mm granular molybdenum powder in 2003 (Precious and Minor Metals Monthly, 2003a).

Nickel.—Because demand exceeded supply in China, the domestic No. 1 refined nickel (99.90% Ni) price increased from 79,000 yuan ($9,550) per metric ton in January to 150,000 yuan ($18,140) per ton in December and was expected to continue to increase in 2004. In 2003, production of nickel concentrates and nickel metal increased compared with that of 2002 (table 1). China was a net importer of 57,063 t refined nickel. The consumption of nickel was estimated to be about 120,000 t. The stainless steel sector was the major consumer of nickel, which accounted for 45% of the total, followed by electroplating, 27%; battery production, 10%; and others, 18%. Because the price of nickel went up sharply in 2003, about 20% of electroplating plants closed down their operations, and many battery producers also operated at about 50% of their output capacity. The demand for nickel was expected to increase because the stainless steel producers planned to increase their production in 2004. Baoshan Iron and Steel Group Corp.'s (Baogang) Shanghai No. 5 Steel Plant put its 150,000-t stainless plant into operation at yearend. Taiyuan Iron and Steel Co. planned to increase its stainless steel output in 2004. Nickel consumption was expected to increase to 140,000 t in 2004. Nickel was imported mainly from Australia, Canada, and Russia. The state-owned Minmetals Group and Cubaniquel of Cuba signed a supply agreement to import nickel and cobalt from Cuba with a total value of $34 million. China Metallurgical Construction Co. planned to invest $6.5 million to develop the Ramu nickel mine in Papua New Guinea (China Metals, 2004d).

The largest nickel producer in China was Jinchuan Nonferrous Metals Corp., which planned to raise funds for its expansion projects through an initial public offer on the stock market either at the end of 2005 or in early 2006. Jinchuan intended to expand its output capacities of copper to 250,000 t; nickel, to 100,000 t; cobalt, to 4,000 t; and precious metals, to 4 t by 2006. An estimated $725 million would be required for the expansion project. The company expanded its copper output capacity to 120,000 t at yearend 2003 and began constructing an additional 80,000 t/yr of copper cathode capacity in 2003. Jinchuan, Jinping Hengao Nonferrous Metals Co., and the Jinping Government signed a cooperation agreement for the development of the nonferrous metals resources in Jinping County, Yunnan Province. Under the terms of the agreement, Jinchuan would provide technical and financial assistance and manpower to explore and develop the copper, nickel, and precious-metals resources in the county. In return, Jinchuan would have the right to purchase raw materials in the county at fair market prices. Jinping Hengao would supply Jinchuan with 1,200 t of nickel matte in 2004 and 2,000 t of nickel matte for the next 8 years. Jinping Hengao had a nickel matte output capacity of 1,500 t in 2003 and planned to expand it to 2,500 t in 2004. Jinchuan undertook mining expansion in Jinping, which was expected to take several years to complete. Jinchuan's mine production in Gansu Province could supply only concentrates that contained about 45,000 t of nickel and 30,000 t of copper, which forced the company to source nickel and copper concentrates from the Kalatongke Mine in the Xinjiang Uygur Autonomous Region and from Mongolia (Copper and Nickel Monthly, 2004b).

Baogang and Yunnan Kunneng Co. Ltd. signed an agreement of cooperation to develop a nickel mine in Yuanjiang County, Yunnan Province. Kunneng received a license to mine nickel in the county for 40 years and invested $9.2 million to build a 1,000-t/yr pilot plant to process nickel. The company planned to build a 10,000-t/yr refined nickel plant within the next 5 years. The average mine ore grade was 1.2% nickel and contained a total reserve of 530,000 t of nickel. Baogang and its subsidiaries consumed about 20,000 t of nickel in their stainless steel operations, and the demand for nickel was expected to increase to 25,000 t in 2005 and 45,000 t in 2006. To secure the supply of nickel, Baogang and Jinchuan signed a strategic alliance agreement in 2003. Baogang agreed to subscribe shares when the Government approved Jinchuan's listing in the stock market, and Jinchuan agreed to supply 20,000 t of refined nickel to Baogang. Baogang and Jinchuan also agreed to invest jointly in overseas nickel projects (Copper and Nickel Monthly, 2004d).

Tin.—China was the leading tin-producing country in the world. Because of strong domestic and international demand, tin prices in both markets increased. Because the supply of concentrates increased, output of tin metal increased by about 20% in 2003 compared with that of 2002. China's unwrought tin exports, however, decreased slightly to 31,285 t, and tin alloy exports also decreased slightly to 9,896 t. Because of the recovery of the global economy, analysts predicted that tin metal prices would increase in 2004. Owing to the increase in domestic demand for refined tin, the volume of exports from China would continue to drop to less than 30,000 t in 2004. China's tin consumption increased to more than 50,000 t, of which tin solder accounted for 50%. Domestic tin consumption was expected to increase slowly but steadily during the next several years because of the expanded demand for tin from the electronics sector (Lead, Zinc, and Tin Monthly, 2004a).

As the result of a flooding incident in Nandan in 2001 and declining tin concentrates supplies in the Guangxi area, Huaxi (China Tin) Group Co. reduced its tin output to about 13,000 t in 2003. Since the Nandan flooding, the Government cracked down on most of the illegal mining activities in the Guangxi Zhuang Autonomous Region and the Provinces of Hunan and Yunnan. The supply of tin concentrates from these areas decreased in 2003. The Government of Lengshuijiang, Hunan Province, shut down the Huangmaojian, the Junwan, the Mengji, the Quanshan, the Tianbao, and the Xuetang Mines midyear. The local government also shut down illegal smelters in the area. Lengshuijiang was a major antimony- and tin-producing area in Hunan Province. The shutdown of these small mines adversely affected the supply of antimony and tin. In 2003, China imported 2,739 t of tin concentrates. The Central Government allowed several mines in the Nandan area to resume operations, but not the tin mines. Analysts expected that the Government would issue the mining license to Gaofeng Mining Co. Ltd. (a subsidiary of Huaxi) for the No. 105 deposit in Nandan after technical renovation of the mine increased ore output capacity to 530,000 t/yr in 2004. Recently, geologists discovered a medium-sized tin deposit in Huichang, Jiangxi Province, which contains 214,000 t of contained tin resources (Lead, Zinc, and Tin Monthly, 2003b, c).

Titanium.—China's titanium sector developed quite rapidly during the past decade, and China may become a major titanium-oxide-producing country in the world. Production of titanium oxide was mainly from ilmenite in the Provinces of Guangdong, Guangxi, Hainan, Sichuan, and Yunnan. In Sichuan, titanium was recovered as a byproduct of ironmaking production; Panzhihua Iron and Steel (Group) Co. (Pangang) was the largest titanium oxide (47% to 48% content) slag producer. More than 60 titanium oxide pigment producers had a total output capacity of about 500,000 t throughout China; most of these producers were concentrated in the Provinces of Guangxi, Hunan, Jiangsu, and Sichuan. In China, titanium oxide was produced mainly from the sulfate process; about 20 producers had an output capacity of more than 12,000 t/yr. The largest titanium producer was Pangang, which had the capacity to produce 200,000 t of titanium concentrates and 60,000 t of titanium oxide pigment. Pangang's titanium oxide pigment was produced from its subsidiaries—Pangang Jinzhou Titanium Industry Co. Ltd., Pangang Titanium Co., and Shanxi Titanium White Co. Ltd. Pangang Jinzhou was the largest chloride process titanium oxide plant in China with an output capacity of 10,000 t/yr; the Central and the Provincial Governments approved an expansion of its output capacity to 30,000 t/yr. The Government approved Pangang's plan to invest $41 million to build a 180,000-t/yr rutile-type titanium oxide slag production line in the Panzhihua Industrial Development Zone, Sichuan Province (TZ Minerals International Pty Ltd., 2003; China Chemical Reporter, 2004).

Tungsten.—China was the leading tungsten-producing country in the world, and its output accounted for more than 80% of the world total. How much the country produced, the demand, and the regulations enacted by the Government affected the volume of exports and influenced the prices in the international markets. During the past decade, the Government and the tungsten producers met yearly to find ways to maintain the tungsten market price and to control production. The Government forced major tungsten producers to reduce their output, closed down illegal mining, and set a tungsten export quota. It set the production quota at 43,380 t and the total tungsten export quota at 16,300 t (W content) for 2003; the export quota share of 118 tungsten mine producers was to be based on their output capacities. Producers were restricted to exporting only their own products, and traders were required to source tungsten products from authorized operating producers and miners. After the China Chamber of Commerce of Metals, Minerals, and Chemicals Importers and Exporters verified contracts between producers and traders and the export prices, the MOFTEC issued an export license. Legal exporters reached a consensus on setting floor prices for major tungsten products. Despite these actions, the prices of tungsten could be held for only a short period in the international markets because of the surplus in the domestic market. In 2003, ammonium paratungstate, ferrotungsten, tungsten carbonate, and tungsten oxide were major exported products. The export of tungsten wire increased by twofold in 2003 compared with that of 2002. The consumption of tungsten increased to 14,500 t in 2003 from 7,800 t in 1999. As a measure to control exports, the Government awarded 13 enterprises tungsten export rights in 2003. In 2004, the export rebate of concentrates and scrap was scheduled to be reduced to zero, and except for tungsten powder, other tungsten products were scheduled to be reduced to 5%. Also, the tungsten export quota will be decreased to 16,000 t (W content). The MOC issued the first 2004 batch export quota for tungsten products—tungsten oxide, 7,006 t; ammonium paratungstate, 5,208 t; tungsten powder and its products, 1,743 t; and tungsten acid and tungstate, 755 t. The increase in domestic demand, the decrease in export rebate, and the reduced export quotas would have direct impacts on the supply of tungsten in the international market. The market prices of tungsten products in the world market were expected to increase (China Metal Bulletin, 2004d).

In December, two state-owned companies, Jiangxi Rare Earth and Rare Metals Tungsten Group Corp. (JRRTC) and Minmetals, agreed to form Jiangxi Tungsten Group Co. Ltd. in Nanchang. Minmetals had a 51% interest, and JRRTC had a 49% interest. Minmetals will play a significant role in the tungsten sector.

Minmetals also held a 30% share in Xiamen Tungsten Co. Ltd., which was listed on the Shanghai Exchange, and was negotiating to acquire the Nanchang Cemented Carbide Plant in Jiangxi Province. In 2003, Xiamen Tungsten acquired a 65% share in Xiamen Honglu Tungsten and Molybdenum Co., a 55.52% interest in Chengdu Hongbo Industry Co., and a 70.93% equity in Ganzhou Hongfei Tungsten and Molybdenum Co. from Xiamen Sanbong Tungsten and Molybdenum Co. With these acquisitions, Xiamen Tungsten became the largest smelting company in China with an output capacity of 10,000 t ammonium paratungstate and tungsten oxide and 5,000 t of tungsten powder and tungsten carbide powder (China Metals, 2004c).

Industrial Minerals

Cement.—China was the leading cement-producing country in the world, and its output accounted for more than 40% of the world's total. More than 7,000 cement producers were registered, but analysts estimated that the actual number might be closer to 9,000 because of the fragmentation of the sector and the small size of many plants. Only about 12 producers had output capacities of more than 1 Mt/yr. During the past several years, cement production grew at an average of about 10% per year. The cement sector may soon face excessive production, and the Government urged investors to analyze the cement sector carefully because supply and demand were basically balanced. During the past couple of years, the Government ordered cement producers to close down plants that used obsolete technology. It encouraged cement producers to reshuffle the cement sector through mergers, regroupings, and takeovers, especially urging east coast producers to take over obsolete plants in the western area and to protect the environment in the west. All new cement plants must meet an output capacity of 2,000 t/d. In 2003, 1,044 cement projects were underway, and the total investment exceeded $9.17 billion. Most of these projects were located on the east coast. The Government ordered commercial banks to restrict credit loans to cement projects (Building Materials Industry Information, 2003).

Rare Earths.—In October, Xi'an Maxon New Material Co. Ltd. was established by Xi'an Xijun New Material Co. Ltd. (51% share) and Korea Resources Corp. of the Republic of Korea (49%) in Xi'an, Shaanxi Province. The company will conduct rare-earth research and develop fluorescence powder and magnetic materials. Most of the finished products will be exported (Precious and Minor Metals Monthly, 2003d).

The State Council approved the restructuring of the domestic rare-earth sector and the establishment of two regional groups—China Northern Rare Earth Group Co. and China Southern Rare Earth Group Co. The northern group was formed by the Nei Mongol Rare Earth Group, Gansu Rare Earth Group Co., and rare-earth producers from the Provinces of Shandong and Sichuan. The southern group included rare-earth producers from Shanghai and the Provinces of Guangdong, Hunan, Jiangsu, and Jiangxi. The Government appointed Chinalco and Minmetals to be the major shareholders of the southern group; each had a 30% share (Precious and Minor Metals Monthly, 2004c).

Mineral Fuels

In the late 1990s, China experienced an electricity surplus in most parts of the country, but power shortages re-emerged in 2002, and 23 Provinces had severe shortages in 2003. Rationalized pricing in the coal and power sectors led to shortages of coal supplies to thermal powerplants. The shortage of power prompted the Government to adopt numerous measures to ensure energy supplies for economic growth in the near future. The Government accelerated the construction of generating powerplants and grids and improved distribution of power through the grids. It also planned to expand and accelerate investment in hydropower and nuclear power; the two sources accounted for only 8% of China's energy use. The Government planned to add an average of 10 billion watts (GW) of new hydropower capacity annually and to build 30 nuclear powerplants with a total output capacity of 30 GW by 2020. Phase 1 of construction of two 1-GW reactors was underway at the Sanmen Nuclear Power Plant in Zhejiang Province. A total of six 1-GW generating units will be built in Sanmen. By yearend 2003, the Government approved the construction of 26 powerplants with a total generating capacity of 11.4 GW. Another 92 projects were waiting to be approved by the Government. By 2005, China will have an installed power-generating capacity of 390 GW. The Government hoped that the balance between supply and demand would be reached by 2006 (China Chemical News, 2004; Precious and Minor Metals Monthly, 2004d).

Coal.—Coal mine safety continued to be a major problem for the Chinese Government. The State Administration of Coal Mine Safety Supervision and the State Administration of Safety in Production Supervision were established under the SETC to oversee the country's coal mine production safety. During the past several years, the Government intensified its efforts to enforce coal mine safety regulations by closing down thousands of coal mines for safety violations. Because of profit temptation, many coal mines restarted their operations after the inspection team left. As a result of several major coal mine accidents throughout the country in 2003, more than 6,000 miners died. More than 70% of the accidents and deaths was at county-level coal mines. County officials depended on tax revenues from coal mines to support the county. According to the State Administration of Work Safety, less than one-half of the 24,439 licensed coal mines met the mandatory safety standards in China. The Government assigned the safety inspectors, but the local governments provided the funding. The Government intended to map out 13 coal-producing areas in 2004, of which each would have an output capacity of 100 Mt/yr (Interfax Information Services, 2004).

In 2003, China's coal production reached a record high (table 1). Coal from China was a major force in the Asia coal market. Owing to the Government provision of export incentives, China's coal exports dramatically increased. Total coal exports increased to 94 Mt in 2003 from 32 Mt in 1998, and most of the increase was from steam coal particularly in the northern Asian market. China's coal exports to Japan, the Republic of Korea, and Taiwan increased sharply during the past several years. Coal from Australia and Indonesia to the northern Asian region declined because buyers from this area wanted to diversify their supply sources.

Coal production was expected to increase by more than 10% to about 1.9 billion metric tons (Gt), and domestic coal consumption would reach 1.8 Gt in 2004. Coal output from Shanxi Province accounted for more than 20% of the country's total coal output; the Province exported about 50% of its output to other Provinces and overseas markets. Powerplants and other coal consumers in Shanxi Province experienced shortages of coal. The country's railway system has been a bottleneck for the development of the coal sector because of a lack of shipping capacity. The Government approved the increase in the average price for steam coal of 12 yuan ($1.45) (tax included) per metric ton in 2004 and approved an increase in the upload price for thermal powerplants of 0.7 fen (0.084 cent) per kilowatthour. Effective on January 1, 2004, the national railway would increase coal delivery cost by 0.25 fen (0.03 cent) per metric ton-kilometer. Domestic coal prices were expected to increase. Also effective on January 1, 2004, the export rebate on steam coal would be reduced to 11% from 13%, and that on coking coal and coke would decrease to 5% each from 13% and 15%, respectively (China Coal News, 2003).

Baosteel Co. Ltd. (a subsidiary of Baogang) and Pingdingshan Coal Group in Henan Province signed a coal purchase agreement in 2003. Baosteel received the first right to purchase coal from Pingdingshan. Pingdingshan had a coal output capacity of 30 Mt/yr, and Baosteel consumed about 15 Mt/yr of coal. The two companies also agreed to form the joint-venture Pingbao Coal Co. to develop the Shoushan coal mine in Henan Province. The mine has coal reserves of 308 Mt, and the joint venture planned to construct a 2.4-Mt/yr coking coal plant. Pingdingshan held a 60% interest in the joint venture, and Baosteel had 40%. Baosteel and the Yongcheng Coal Group in Henan Province formed the joint-venture Zhenglong Coal Co. to develop a coal mine in Henan Province. These two joint ventures also established two companies, Baoding Power Co. and Baosheng Power Co., in Shanghai to penetrate the coal market on the east coast (China Metals, 2003a).

Oil and Natural Gas.—Because of the rapid economic growth in China, the demand for oil has increased sharply. China became more dependent on oil imports to balance supply and demand. In 2003, China's crude oil imports increased to more than 91 Mt and were expected to increase to 120 Mt in 2004. China will overtake Japan as the leading crude-oil-importing country in Asia soon (China Chemical News, 2004).

China's onshore natural gas resources are mainly in Sichuan Province. Offshore natural gas resources are in Dong Hai (East Sea) and Nan Hai (South Sea). Geologists expected that additional natural gas would be discovered in these areas in the future. The Government predicted that the annual demand for natural gas would reach 63 billion cubic meters in 2005, 97 billion cubic meters in 2010, and 142 billion cubic meters in 2020. Chongqing City and Sichuan Province, which hold most of China's natural gas reserves, produced more than 50% of the total. In 2003, a massive explosion in the Chuandongbei gasfield in Kai County of Chongqing City killed more than 200 people, hospitalized more than 1,000 people, and forced more than 60,000 residents in the explosion area to relocate. China National Petroleum Corp. was the proprietor and operator of the gasfield. Accidents in gasfields and oilfields were less common than in coal mines (Washington Post, The, 2003).

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TABLE 1
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		1999	2000	2001	2002	2003
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	8,500	9,000	9,800	11,000	13,000
Alumina	do.	3,840	4,330	4,650	5,450	6,110
Metal, refined, primary and secondary	do.	2,810	2,990	3,570	4,510	5,970
Antimony:						
Mine, Sb content		89,600	110,000	140,000	100,000	100,000
Metal		84,500	106,000	148,000	124,000	90,000
Bismuth:						
Mine output, Bi content		2,680	1,120	1,250	950	1,000
Metal		860	770	1,230	700	800
Cadmium, smelter		2,150	2,370	2,510	2,440	2,500
Chromite, gross weight	thousand tons	220	208	182	180	200
Cobalt:						
Mine output, Co content		250	90	150	1,000	1,000
Metal		300	410	680	980	1,000
Copper:						
Mine output, Cu content		520,000	593,000	587,000	568,000	610,000
Metal:						
Smelter, primary		837,000	1,020,000	1,150,000	1,180,000	1,380,000
Refined						
Primary	thousand tons	836	1,020	1,220	1,300	1,420
Secondary	do.	344	350	300	350	430
Total	do.	1,180	1,370	1,520	1,650	1,850
Gold, mine output, Au content		173	180	185	192	205
Indium		200	200	150	120	100
Iron and steel:						
Iron ore, gross weight	thousand tons	237,000	223,000	220,000	231,000	261,000
Pig iron	do.	125,390 [4]	131,010 [4]	155,540 [4]	170,850 [4]	213,670 [4]
Ferroalloys	do.	3,810	4,030	4,500	4,840	6,340
Steel, crude	do.	124,260 [4]	128,500 [4]	151,630 [4]	182,370 [4]	222,340 [4]
Steel, rolled	do.	121,100 [4]	131,460 [4]	160,680 [4]	192,520 [4]	241,080 [4]
Lead:						
Mine output, Pb content		549,000	660,000	676,000	641,000	955,000
Metal:						
Smelter, primary		597,000	830,000	840,000	916,000	1,250,000
Refined						
Primary		821,000	998,000	984,000	1,100,000	1,290,000
Secondary		97,000	102,000	211,000	230,000	290,000
Total		918,000	1,100,000	1,200,000	1,330,000	1,580,000
Magnesium metal, primary		120,000	190,000	200,000	230,000	342,000
Manganese:						
Ore, Mn content	thousand tons	640	700	860	900	920
Metal		100,000	120,000	150,000	190,000	320,000
Mercury, mine output, Hg content		200	200	190	495	610
Molybdenum, mine output, Mo content		29,700	28,800	28,200	29,300	31,000
Nickel:						
Mine output, Ni content		49,500	50,300	51,500	53,700 [r]	61,000
Matte		50,100	57,000	59,000	59,200 [r]	63,000
Smelter		44,400	50,900	49,500	52,400	64,700
Silicon, metal		395,000	480,000	500,000	580,000	680,000
Silver, mine output, Ag content		1,360	1,600	1,910	2,200 [r]	2,400
Tin:						
Mine output, Sn content		80,100	99,400	95,000	62,000	102,000
Metal		90,800	112,000	105,000	82,000	98,000

See footnotes at end of table.

TABLE 1--Continued

CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		1999	2000	2001	2002	2003
METALS--Continued						
Titanium:						
Ilmenite, TiO_2 equivalent		90,000	125,000	150,000	375,000	400,000
Sponge		1,660	1,900	2,470	3,650	4,120
Tungsten, mine output, W content		31,100	37,000	38,500	49,500	50,000
Vanadium, in vanadiferrous slag product		26,000	30,000	30,000	33,000	35,000
Zinc:						
Mine output, Zn content	thousand tons	1,480	1,780	1,700	1,550	2,030
Refined, primary and secondary	do.	1,700	1,980	2,040	2,100	2,320
INDUSTRIAL MINERALS						
Asbestos		329,000	315,000	310,000	270,000	350,000
Barite	thousand tons	2,800	3,500	3,600	3,100	3,500
Boron, mine, B_2O_3 equivalent		110,000	145,000	150,000	145,000	130,000
Bromine		42,000	42,000	40,000	42,000	42,000
Cement, hydraulic	thousand tons	573,000 [4]	597,000 [4]	661,040 [4]	725,000 [4]	862,080 [4]
Diatomite		340,000	350,000	350,000	370,000	380,000
Dolomite	thousand tons	6,600	6,700	6,700	7,000	7,300
Fluorspar	do.	2,400	2,450	2,450	2,450	2,650
Graphite		300,000	430,000	450,000	629,000 [r]	710,000
Gypsum	thousand tons	6,700	6,800	6,800	6,850	6,850
Kaolin	do.	1,500	2,700	2,500	3,000	3,100
Lithium minerals, all types		15,500	16,000	16,000	16,000	17,000
Magnesite	thousand tons	2,450	4,070	3,580	3,700	3,700
Nitrogen, N content of ammonia	do.	28,300	27,700	28,200	30,300 [r]	31,500
Phosphate rock, P_2O_5 equivalent	do.	6,000	5,820	6,300	6,900	7,550
Potash, marketable, potassium oxide equivalent	do.	260	380	385	450	500
Rare earths, rare-earth oxide equivalent		70,000	73,000	81,000	88,000	92,000
Salt	thousand tons	28,124 [4]	31,280 [4]	34,105 [4]	36,024 [4]	34,377 [4]
Sodium compounds: soda ash, natural and synthetic	do.	7,654 [4]	8,342 [4]	9,144 [4]	10,330 [4]	11,336 [4]
Sulfur:						
Native	do.	280	290	290	290	290
Content of pyrite	do.	3,860	3,370	3,090	3,240	3,400
Byproduct, all sources	do.	1,630	1,900	2,000	2,200	2,400
Total	do.	5,770	5,560	5,380	5,730	6,090
Talc and related materials	do.	3,900	3,500	3,500	2,500 [r]	2,600
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	do.	182,000	176,000	190,000	250,000 [r]	218,000
Bituminous	do.	822,000	781,000	965,000	1,110,000 [r]	1,470,000
Lignite	do.	45,600	42,000	47,800	53,000 [r]	52,000
Total	do.	1,050,000	999,000	1,200,000	1,410,000 [r]	1,740,000
Coke, all types	do.	121,100 [4]	121,840 [4]	131,310 [4]	142,800 [4]	138,800 [4]
Gas, natural:						
Gross	billion cubic meters	25	27	30	33	35
Marketed	do.	20	22	24	26	28
Petroleum:						
Crude, including crude from oil shale	million 42-gallon barrels	1,190	1,200	1,210	1,240	1,260
Refinery products	do.	920	1,470	1,460	1,530	1,600

[r] Revised.

[1] Table includes data available through August 30, 2004.

[2] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[3] The country also produces diamond, gallium, germanium, platinum-group metals, and uranium; no reliable basis, however, is available for the estimation of output levels.

[4] Reported by China's State Statistical Bureau.

TABLE 2

CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities	Annual capacity[e]
Aluminum:				
Alumina		Pingguo Aluminum Co. (Aluminum Corporation of China)	Guangxi, Pingguo	850
Do.		Guizhou Aluminum Plant (Aluminum Corporation of China)	Guizhou, Guiyang	650
Do.		Zhengzhou Aluminum Plant (Aluminum Corporation of China)	Henan, Zhengzhou	1,300
Do.		Zhongzhou Aluminum Plant (Aluminum Corporation of China)	Hunan, Zhongzhou	1,100
Do.		Shandong Aluminum Plant (Aluminum Corporation of China)	Shandong, Zibo	950
Do.		Shanxi Aluminum Plant (Aluminum Corporation of China)	Shanxi, Hejin	1,400
Metal		Baiyin Aluminum Plant	Gansu, Baiyin	150
Do.		Lanzhou Aluminum Plant	Gansu, Lanzhou	210
Do.		Liancheng Aluminum Plant	do.	235
Do.		Pingguo Aluminum Co. (Aluminum Corporation of China)	Guangxi, Pingguo	380
Do.		Guizhou Aluminum Plant (Aluminum Corporation of China)	Guizhou, Guiyang	400
Do.		Jiaozuo Wanfang Aluminum Co. Ltd.	Henan, Jiaozuo	176
Do.		Henan Wanji Aluminum Co. Ltd.	Henan, Luoyang	180
Do.		Henan Huanghe Mianchi Aluminum Plant	Henan, Mianchi	115
Do.		Sanmenxia Tianyuan Aluminum Co. Ltd.	Henan, Sanmenxia	110
Do.		Shangqiu Aluminum Smelter	Henan, Shangqiu	115
Do.		Yichuan Yugang Longquan Aluminum Co.	Henan, Yichuan	200
Do.		Henan Shenhuo Aluminum-Electricity Co. Ltd.	Henan, Yongcheng	200
Do.		Hanjiang Danjiangkou Aluminum Co. Ltd.	Hubei, Danjiangkou	73
Do.		Zhengzhou Aluminum Plant (Aluminum Corporation of China)	Hunan, Zhengzhou	60
Do.		Jilin Aluminum Co.	Jilin, Panzhi	70
Do.		Fushun Aluminum Plant	Liaoning, Fushun	175
Do.		Baotou Aluminum Plant	Nei Mongol, Baotou	216
Do.		Qingtongxia Aluminum Plant	Ningxia, Qingtongxia	240
Do.		Qinghai Aluminum Smelter (Aluminum Corporation of China)	Qinghai, Xining	255
Do.		Tongchuan Xingguang Aluminum Co. Ltd.	Shaanxi, Tongchuan	80
Do.		Huaxin Aluminum Industry Co.	Shandong, Chiping	160
Do.		Taishan Aluminum-Power Co. Ltd.	Shandong, Feicheng	125
Do.		Shandong Aluminum Plant (Aluminum Corporation of China)	Shandong, Zibo	55
Do.		Taiyuan Oriental Aluminum Co.	Shanxi, Taiyuan	75
Do.		Shanxi Guanlu Aluminum Co. Ltd.	Shanxi, Yuncheng	210
Do.		Yunnan Aluminum Plant	Yunnan, Kunming	130
Antimony		Huaxi (China Tin) Group Industrial Co.	Guangxi, Hechi	25
Do.		Xikuangshan Twinkling Star Co. Ltd.	Hunan, Lengshuijiang	37
Asbestos		China National Nonmetallic Industry Corp.	Nei Mongol, Baotou; Shanxi, Lai Yuan, and Lu Liang	130
Barite		do.	Guizhou, Xiangshou	NA
Coal		Hebei Provincial Government	Hebei	70,000
Do.		Heilongjiang Provincial Government	Heilongjiang	100,000
Do.		Henan Provincial Government	Henan	100,000
Do.		Liaoning Provincial Government	Liaoning	70,000
Do.		Nei Mongol Provincial Government	Nei Mongol	90,000
Do.		Shandong Provincial Government	Shandong	60,000
Do.		Shanxi Provincial Government	Shanxi	400,000
Do.		Sichuan Provincial Government	Sichuan	80,000
Do.		Shenhua Coal Corp.	Ningxia, Nei Mongol, and Shaanx	40,000
Cobalt	tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	1,200

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities	Annual capacity[e]
Copper, refined		Jinchang Smelter (Tongling Nonferrous Metals Co.)	Anhui, Tongling	130
Do.		Jinlong Smelter (Tongling Nonferrous Metals Co.)	do.	120
Do.		Wuhu Smelter (Hengxin Copper Industry Group Co.)	Anhui, Wuhu	60
Do.		Baiyin Nonferrous Metals Co.	Gansu, Baiyin	50
Do.		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	120
Do.		Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.		Daye Nonferrous Metals Co.	Hubei, Daye	150
Do.		Zhangjiagang United Copper Co. (Tongling Nonferrous Metals Co.)	Jiangsu, Zhangjiagang	100
Do.		Guixi Smelter (Jiangxi Copper Company Limited)	Jiangxi, Guixi	400
Do.		Huludao Copper Smelter (Huludao Zinc Smelting Co.)	Liaoning, Huludao	100
Do.		Taiyuan Copper Industry Co.	Shanxi, Taiyuan	30
Do.		Zhongtiaoshan Nonferrous Metals Co.	Shanxi, Yuangu	80
Do.		Tianjin Copper Electrolysis Factory	Tianjin	25
Do.		Yunnan Smelter (Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	160
Gas, natural	billion cubic meters	China National Petroleum Corp.	Sichuan	10
Gold, refined	tons	China National Gold Corp.	Henan, Lingbao	10
Do.	do.	Laizhou Gold Co.	Shandong, Laizhou	15
Do.	do.	Zhaoyuan Gold Co.	Shandong, Zhaoyuan	15
Graphite		China National Nonmetallic Industry Corp.	Shandong, Laixi and Pingdu	190
Indium	metric tons	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	60
Do.	do.	Liuzhou Zinc Product Co.	Guangxi, Liuzhou	20
Do.	do.	Zhuzhou Smelter	Hunan, Zhuzhou	60
Do.	do.	Huludao Nonferrous Metals Group Co.	Liaoning, Huludao	30
Iron and steel:				
Iron ore		Maanshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.		Shoudu (Capital) Mining Co.	Beijing	20,000
Do.		Meishan Metallurgical Co.	Shanghai	2,000
Do.		Jiuquan Iron and Steel Co.	Gansu, Jiayuguan	4,000
Do.		Hainan Iron Mine	Hainan, Changjiang	4,600
Do.		Handan Xingtai Metallurgical Bureau	Hebei, Handan	3,800
Do.		Tangshan Iron and Steel Co.	Hebei, Tangshan	3,000
Do.		Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	5,100
Do.		Banshigou Iron Mine Mining Co.	Jilin, Hunjiang	1,400
Do.		Anshan Mining Co.	Liaoning, Anshan	30,000
Do.		Benxi Iron and Steel Co.	Liaoning, Benxi	13,700
Do.		Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	10,000
Do.		Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	4,000
Do.		Dabaoshan Mining Co.	Guangdong, Qujiang	1,670
Do.		Panzhihua Mining Co.	Sichuan, Panzhihua	13,000
Do.		Kunming Iron and Steel Co.	Yunnan, Kunming	1,400
Ferroalloys		Shoudu (Capital) Iron and Steel (Group) Co.	Beijing	35
Do.		Northwest Ferroalloy Co.	Gansu, Yongdeng	60
Do.		Zunyi Ferroalloy Co.	Guizhou, Zunhi	100
Do.		Jilin Ferroalloy Co.	Jilin, Jilin	250
Do.		Jinzhou Ferroalloy Co.	Liaoning, Jinzhou	90
Do.		Liaoyang Ferroalloy Co.	Liaoning, Liaoyang	70
Do.		Shanghai Iron and Steel Co. Ltd.	Shanghai	180
Do.		Emei Ferroalloy Co.	Sichuan, Emei	70
Do.		Hengshan Ferroalloy Co.	Zhejiang, Jiande	70

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities	Annual capacity[e]
Iron and steel--Continued:			
Crude steel	Maanshan Iron and Steel Co.	Anhui, Maanshan	3,000
Do.	Shoudu (Capital) Iron and Steel (Group) Co. (Shougang)	Beijing	8,500
Do.	Handan Iron and Steel General Work (Handan)	Hebei, Handan	2,400
Do.	Tangshan Iron and Steel Co. (Taigang)	Hebei, Tangshan	2,300
Do.	Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	10,000
Do.	Anshan Iron and Steel (Group) Co. (Angang)	Liaoning, Anshan	8,500
Do.	Benxi Iron and Steel Co. (Bengang)	Liaoning, Benxi	2,700
Do.	Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	3,500
Do.	Baoshan Iron and Steel (Group) Corp. (Baosteel)	Shanghai	13,000
Do.	Shanghai Iron and Steel Co. Ltd.	do.	6,000
Do.	Taiyuan Iron and Steel Co. (Taigang)	Shanxi, Taiyuan	2,500
Do.	Panzhihua Iron and Steel (Group) Co. (Pangang)	Sichuan, Panzhihua	3,000
Lead	Baiyin Nonferrous Metals Co. Ltd.	Gansu, Baiyin	50
Do.	Shaoguan Smelter	Guangdong, Shaoquan	100
Do.	Anyang Smelter (Yubei Metal Co.)	Henan, Anyang	150
Do.	Jiyuan Wangyang Nonferrous Smelter	Henan, Jiaozuo	45
Do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	Henan, Jiyuan	200
Do.	Hanjiang Smelter	Hubei, Luhekou	50
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyang	80
Do.	Zhuzhou Smelter	Hunan, Zhuzhou	100
Do.	Kunming Smelter	Yunnan, Kunming	100
Lithium, $LiCO_3$	Sichuan Shehong Lithium Co. Ltd.	Sichuan, Shehong	2
Do.	Xinjiang Lithium Co.	Xinjiang, Urumqi	5
Magnesium	Fushun Aluminum Plant	Liaoning, Fushun	5
Do.	Ningxia Huayuan Magnesium Group	Ningxia, Yinchuan	15
Do.	Huayu Interprises (Group) Ltd.	Shanxi, Jishan	35
Do.	Taiyuan Tongxiang Magnesium Metal Co. Ltd.	Shanxi, Taiyuan	42
Do.	Taiyuan Yiwei Magnesium Co. Ltd.	Do.	21
Do.	Wenxi Biyun Magnesium Co. Ltd.	Shanxi, Wenxi	30
Do.	Wenxi Yinguang Magnesium Group	Do.	40
Do.	Minhe Magnesium Plant	Qinghai, Minhe	7
Manganese, metal	Chongqing Tycoon Manganese Co. Ltd.	Chongqing	23
Do.	Guangxi Dameng Manganese Industry Co. Ltd.	Guangxi, Nanning	70
Molybdenum, concentrate	Luoyang Luanchuan Molybdenum Industry Group Co., Ltd.	Henan, Luanchuan	13
Do.	Jinduichang Mining Corp.	Shaanxi, Huaxian	9
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	60
Do.	Chengdu Electro-Metallurgy Factory	Sichuan, Chengdu	5
Petroleum, crude	Shengli Bureau	Hebei, Shengli	33,500
Do.	Daqing Bureau	Heilongjiang, Daqing	55,000
Do.	Liaohe Bureau	Liaoning, Liaohe	15,000
Do.	Bohai Offshore Oil Corp.	Bohai	4,000
Do.	Nanhai East Corp.	Nanhai	5,000
Potash	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai	40
Rare earths	Gansu Rare Earths Co.	Gansu, Baiyin	32
Do.	Jiangxi Rare Earths Co.	Jiangxi, Nanchang	1
Do.	Zhujiang Smelter	Guangdong, Guangzhou	5
Do.	Baotou Iron and Steel and Rare Earths Corp.	Nei Mongol, Baotou	25
Do.	Shanghai Yaolong Nonferrous Metals Co.	Shanghai	2
Salt	Shandong Haihua Group Co. Ltd.	Shandong, Weifang	1,400
Do.	Zigong Zhangjiaba Salt Chemical Plant	Sichuan, Zigong	250

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities	Annual capacity[e]
Talc	China National Nonmetallic Industry Corp.	Guangxi, Longshen	130
Do.	do.	Liaoning, Haicheng	50
Do.	do.	Shandong, Qixia	5
Tin, smelter	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	25
Do.	Pinggui Mining Bureau	Guangxi, Zhongshan	8
Do.	Yunnan Tin Industry Co.	Yunnan, Gejiu	55
Titanium, sponge	Zunyi Titanium Plant	Guizhou, Zunyi	6
Do.	Fushun Aluminum Plant	Liaoning, Fushun	1
Tungsten, concentrate	Shizhuyuan Nonferrous Metals Co.	Hunan, Chenzhou	5
Do.	Yaogangxian Tungsten Mine	Hunan, Yizhang	3
Do.	Nanchang Co.	Jiangxi, Nanchang	15
Zinc	Northwest China Lead-Zinc Smelter (Baiyin Nonferrous Metals Co. Ltd.)	Gansu, Baiyin	150
Do.	Shaoquan Smelter	Guangdong, Shaoquan	170
Do.	Liuzhou Zinc Products Factory	Guangxi, Liuzhou	100
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyan	60
Do.	Zhuzhou Smelter	Hunan, Zhuzhou	300
Do.	Huludao Zinc Smelting Co.	Liaoning, Huludao	330
Do.	Laibin Smelter	Yunnan, Laibin	60

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1] Companies are owned by either a State Government or a Provincial Government.

TABLE 3
CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 2003

(Metric tons)

	Quantity	Value (thousands)
METALS		
Aluminum:		
Alumina	60,000	$21,330
Metal and alloys:		
Unwrought	1,249,249	1,792,572
Semimanufactures	273,293	667,740
Antimony metal, unwrought	25,243	55,913
Barium sulfate	2,170,000	67,443
Bismuth, includes powder, unwrought, and waste	4,626	25,782
Copper, metal and alloys:		
Unwrought	67,083	118,704
Semimanufactures	232,880	690,222
Iron and steel:		
Ferrosilicon	840,000	433,609
Pig iron and cast iron	710,000	125,604
Steel:		
Bars and rods	2,390,000	690,930
Shapes and sections	270,000	95,543
Sheets and plates	1,820,000	743,504
Tube and pipe	540,000	517,705
Lead:		
Metal, refined	679	253
Other	14,411	12,401
Magnesium metal, unwrought	151,162	230,854
Manganese, unwrought	165,458	161,777
Silicon metal	445,260	408,250
Tin, metal and alloys, unwrought	41,220	180,411
Tungsten, tungstates	8,548	41,733
Zinc:		
Metal and alloys, unwrought	484,231	396,580
Oxide and peroxide	96,960	65,607
INDUSTRIAL MINERALS		
Cement	5,330,000	171,578
Cerium oxide	9,290	16,649
Fluorspar	950,000	111,257
Granite	4,288,180	914,087
Graphite, natural	339,609	53,518
Magnesia, fused	392,736	110,202
Rare earths:		
Chorides	5,775	4,155
Oxides	5,833	56,775
Strontium carbonate	72,195	28,669
Talc	730,000	69,901
MINERAL FUELS		
Coal	93,880,000	2,750,324
Coke, semicoke	14,720,000	1,672,361
Petroleum:		
Crude oil	8,130,000	1,661,217
Refinery products	13,820,000	3,720,664

Source: General Administration of Customs of the People's Republic of China, 2003, China monthly exports and imports, no. 12.

TABLE 4
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 2003

(Metric tons unless otherwise specified)

		Quantity	Value (thousands)
METALS			
Aluminum:			
Alumina		5,610,000	$1,375,761
Metal and alloys, unwrought		880,735	1,227,101
Semimanufactures		531,477	1,490,885
Scrap		653,422	442,193
Antimony:			
Antimony, crude		65	14
Other		19,050	13,259
Chromium, chromite		1,780,000	150,832
Copper:			
Ore and concentrates		2,670,000	1,288,186
Metal and alloys, unwrought		1,562,152	2,818,470
Semimanufactures		1,055,765	2,783,388
Scrap		3,161,784	1,332,272
Iron and steel:			
Iron ore		148,130,000	4,856,502
Steel:			
Bars and rods		1,220,000	645,824
Scrap		9,290,000	1,405,292
Seamless pipe		1,130,000	1,009,644
Shapes and sections		860,000	296,983
Sheets and plates		33,250,000	17,421,726
Lead:			
Ore and concentrates		64,743	196,518
Metal, refined		21,673	11,358
Bars, rod, and wire		1,997	3,220
Other		26,782	11,918
Manganese ore		2,860,000	204,978
Nickel:			
Ore and concentrates		8,405	4,702
Matte		9,185	15,069
Metal, unwrought		58,074	520,905
Tin, ore and concentrates		2,200	3,550
Titanium dioxide		228,533	393,100
Zinc:			
Ore and concentrates		710,714	148,054
Metal, refined		102,521	80,826
Alloy		161,422	174,859
Bar, rod, and wire		40,445	41,019
INDUSTRIAL MINERALS			
Diamond	kilograms	12,738	1,242,019
Fertilizers:			
Compound fertilizers		4,990,000	900,007
Diammonium phosphate		2,610,000	503,904
Potassium chloride		6,230,000	739,418
Potassium sulfate		330,000	56,555
Urea		130,000	15,415
Sodium carbonate		301,277	31,405
MINERAL FUELS			
Coal		10,760,000	364,304
Petroleum:			
Crude oil		91,120,000	19,808,734
Refinery products		28,240,000	5,861,182

Source: General Administration of Customs of the People's Republic of China, 2003, China monthly exports and imports, no. 12.

TABLE 5
CHINA: RESERVES AND RESERVE BASE OF MAJOR MINERAL COMMODITIES

(Thousand metric tons unless otherwise specified)

Commodities		Reserves	Reserve base
Antimony, Sb		890	1,200
Arsenic, As		910	1,900
Asbestos, mineral		39,000	55,000
Barite, ore	million tons	100	270
Bauxite	do.	720	1,800
Bentonite	do.	890	1,900
Bismuth, Bi		260	270
Boron, B_2O_3		32,000	33,000
Cadmium, Cd		92	290
Chromite, ore		4,400	5,700
Coal	billion tons	330	690
Cobalt, Co		80	560
Copper, Cu		30,000	38,000
Diamond, mineral	kilograms	3,200	4,040
Diatomite, ore		100,000	310,000
Fluorite, CaF_2		2,400	110,000
Gallium, Ga	tons	4,100	110,000
Gas, natural	billion cubic meters	2,000	3,800
Gold, Au	tons	1,200	4,130
Graphite, mineral		74,000	140,000
Gypsum, ore	million tons	4,900	59,000
Iodine, I	tons	31,000	4,200,000
Iron ore, ore	million tons	21,000	36,000
Kaolin	do.	550	990
Lead, Pb		12,000	25,000
Lithium, Li_2O		1,000	1,300
Magnesite, ore	million tons	1,400	2,000
Manganese, ore	do.	200	470
Mercury, Hg		21	61
Mirabilite, Na_2SO_4	million tons	9,900	10,600
Molybdenum, Mo		3,300	6,600
Nickel, Ni		3,000	5,100
Petroleum	million tons	2,400	9,400
Phosphorus, ore	do.	4,000	13,000
Platinum-group metals, metal	tons	15	330
Potash, KCl		270,000	590,000
Pyrite, ore	million tons	2,100	3,200
Rare earths, rare-earth oxide		21,000	64,000
Salt, NaCl	billion tons	190	1,100
Silver, Ag		34	85
Strontium, mineral		1,000	3,800
Sulfur, natural, S		240	320,000
Talc, ore		95,000	150,000
Tantalum, Ta_2O_5		31	61
Tin, Sn		1,600	3,100
Titanium, TiO_2	million tons	210	440
Trona, mineral		75,000	103,000
Tungsten, WO_3		2,900	5,280
Vanadium, V_2O_5		13,000	22,000
Zinc, Zn		37,000	60,000

Source: China Statistical Yearbook 2004, p. 9.

THE MINERAL INDUSTRY OF FIJI

By Travis Q. Lyday

The Republic of the Fiji Islands is an archipelago that comprises 322 islands, of which only about 100 are inhabited. The islands are located about 3,000 kilometers (km) northeast of Sydney, Australia, in the southwestern Pacific Ocean and consist of 18,376 square kilometers of land area (Resource Information Unit, 2002, p. 4; Bank of Hawaii, 1993§[1]). The archipelago is bound on the west by the Yasawas Islands, which are the closest islands of Fiji to the Melanesian islands of Vanuatu. Along the eastern boundary of Fiji lie the numerous islands of the Lau Group, which border the islands of the Kingdom of Tonga in western Polynesia. Near the center of the Yasawas and the Laus lie the four main islands of Fiji, which are the following, by size: Viti Levu, where the capital city of Suva is located, Vanua Levu, Taveuni, and Kandavu. These islands roughly straddle the dividing line between Melanesia and Polynesia (Fowler, undated§). The population of about 870,000 was made up of indigenous Fijians (approximately 50%), which were predominantly Melanesian with a Polynesian admixture; Indo-Fijians (45%); and Europeans, other Pacific Islanders, overseas Chinese, and others (5%) (Resource Information Unit, 2004, p. 2; U.S. Central Intelligence Agency, 2003§; U.S. Department of State, 2003§).

The economy was largely based on agriculture, fishing, forestry, garment manufacturing, mining, and tourism. Fiji's gross domestic product (GDP) based on purchasing power parity was $4,180 million and represented a per capita income of $5,024. The country's real GDP grew by 4.4% in 2003 (International Monetary Fund, 2004).

Fiji's mining industry in 2003 was centered on gold, which was produced only by the Sydney, Australia-based owner and operator Emperor Mines Ltd. at its Vatukoula Mine. The Vatukoula Mine, which is often referred to as the "Emperor Mine," is located on the northwestern coast of Viti Levu Island approximately 380 km by road from the port city of Suva on the southeastern coast of the island. The ores at the Vatukoula Mine also contain silver, but no production was reported for 2003.

Most industrial minerals used in Fiji were imported, although the country has significant industrial mineral resources, such as bauxite, limestone, marble, and mineral sands, which could be developed for local markets and for export. Fiji imported significant amounts of brick facing and building stone, lime, and marble, although domestic deposits (some of which had small production for local use) were known.

Fiji's metal ores included copper, gold, lead, silver, and zinc deposits. Gold was first discovered in Fiji in the Navua River in 1868, in the Nasivi River at Tavua in 1872, and at Mount Kasi in 1929. In 2003, Emperor Mines celebrated the 70th anniversary of the discovery of gold in the Vatukoula area. During its first 70 years, about 6.9 million troy ounces [110,600 kilograms (kg)] of gold was produced at the Emperor Mine (Resource Information Unit, 2004, p. 2). The Emperor Mine, which employed more than 2,100 employees, was Fiji's second largest private employer. Unrefined gold was the country's second leading export commodity and represented 6% to 7% of Fiji's export revenues (Resource Information Unit, 2004, p. 2).

At yearend 2003, Emperor Mines was in the process of implementing its Phase 2 expansion, which was initiated in 2002 to increase gold production, lower operating costs, and help reduce the risk inherent in relying on a single high-grade ore body. The Phase 2 expansion, which was to include the purchase of new heavy vehicles and new refrigeration units, the construction of two ventilation shafts, and increased underground development, was expected to be completed by yearend 2004. As part of the project, the Cagi Vou Shaft, which was constructed for additional ventilation within the Smith Shaft production section, was commissioned in October. Work also continued on the Smith Shaft No. 2 winder replacement and associated headgear work, which was to be commissioned in early 2004. Additionally, reaming of the Sautu Vent Shaft to the full shaft diameter of 3.6 meters (m) was completed to a depth of 200 m from the surface, and the remainder was holed through to the surface at a diameter of 1 m to facilitate a conventional sink. At the end of 2003, the shaft presink had reached a distance of 12 m below the collar. Emperor Mines projected that the expansion project, once completed, would result in a 40% increase in production, from 120,000 ounces per year (3,400 kilograms per year) to 180,000 ounces per year (5,100 kilograms per year) (Emperor Mines Ltd., 2004).

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TABLE 1
FIJI: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1999	2000	2001	2002	2003[e]
Cement, hydraulic[e]	metric tons	95,000	95,000	95,000	100,000	100,000
Gold, mine output, Au content	kilograms	4,430 [e]	3,840 [e]	3,836 [r, 3]	3,731 [r, 3]	3,250
Silver, mine output, Ag content	do.	2,130 [e]	1,480 [e]	1,974 [r, 3]	1,901 [r, 3]	1,500

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised.

[1] Table includes data available through May 23, 2004.

[2] In addition to the commodities listed, crushed and dimension stone, sand and gravel, and sand for cement manufacture are produced, but data are insufficient to make reliable estimates of quantities.

[3] Reported figure.

THE MINERAL INDUSTRY OF INDIA

By Chin S. Kuo

India's economic growth in 2003 was partly attributable to an excellent monsoon season in the country that contributed to an increase in agricultural production. The growth rate of the gross domestic product (GDP) was moderate at 5.6% compared with 4.7% in 2002. Agriculture contributed 25% of the country's GDP, and the industry and service sectors accounted for 26% and 49% of the GDP, respectively. Economic growth was constrained by inadequate infrastructure, cumbersome bureaucratic procedures, and high interest rates. The Government's $10 billion nationwide road-construction program was expected to be a boon for the cement and steel industries (Wall Street Journal, 2003).

The United States was India's leading trading partner with bilateral trade of $13 billion in 2003. Principal U.S. exports to India were advanced machinery, aircraft and parts, computer hardware, ferrous waste and scrap metal, and fertilizers. Major U.S. imports from India included agricultural and related products, chemicals, gems and jewelry, leather products, and textiles and ready-made garments. The United States also was India's largest investment partner. Foreign investment in India was particularly sought after in mining, petroleum exploration and processing, ports, power generation, roads, and telecommunications (U.S. Department of State, 2004).

India is endowed with significant mineral resources. Metal production was dominated by bauxite, chromite, copper, gold, iron, lead, manganese, silver, tin, and zinc. Output of industrial minerals was mainly barite, dolomite, gypsum, kaolin, limestone, magnesite, phosphate rock, and steatite. India was the world's leading producer of mica; it ranked 3d in the production of barite, chromite, and coal and lignite; 4th in iron ore; 6th in bauxite; 7th in manganese ore; 10th in crude steel; and 11th in aluminum (Indian Bureau of Mines, 2003).

The Mines and Geology Department of the State of Andhra Pradesh discovered a uranium deposit in the Nalgonda District. The Government-owned Uranium Corp. of India applied for a mining lease for the deposit (Mining Journal, 2003b).

Government Policies and Programs

A committee appointed by the Government suggested that top import customs duties should be reduced to 25% from the present 30%. The import duty on ferroalloys could be reduced to 20% from the current 25%. It also proposed that in 2 to 3 years, there should be only two levels of customs duty—10% on raw materials and 20% on finished products. Ferroalloys, nonferrous metals, and steel would come under the 10% duty. Ferroalloys producers opposed the committee's recommendations because they feared that they would not be able to compete with low-cost foreign producers (Metal Bulletin, 2003i).

The Government reduced the basic customs duty on imported metallurgical coke to 5% from 15%. India imported 3 million metric tons per year (Mt/yr) of metallurgical coke. The Government also abolished the dumping duty on metallurgical coke imported from China (Metal Bulletin, 2003d).

The customs duty on gold bars and coins was cut to $2.10 per 10 grams from $5.25. The import tariff on polished diamonds and gemstones was cut to 5% from 15%. The Government also abolished the customs duty on colored rough gemstones and semiprocessed, half-cut, and broken diamond (Reuters, 2003b§[1]).

The Government withdrew the 4% special additional duty on phosphate rock and sulfur imports. The 5% import duty on these imports, however, remained in effect (Fertilizer Week, 2003a).

Commodity Review

Metals

Aluminum.—The following companies were engaged in the manufacture of alumina and aluminum: Bharat Aluminium Co. Ltd. (Balco), Hindalco Industries Ltd., Indian Aluminium Co. Ltd. (Indal), Madras Aluminium Co. Ltd. (Malco), and National Aluminium Co. Ltd. Of these, Hindalco, Indal, and Malco were private companies. India's total installed production capacities for alumina and aluminum were 2.487 Mt/yr and 714,000 metric tons per year (t/yr), respectively.

Continental Resources Ltd. of the United States planned to initiate a baseline study on the Gandhamardan bauxite deposit in the Balangir area of eastern India. The baseline study involved mainly environmental work and began in summer 2003. The deposit was found to consist of good-grade bauxite ore in excess of 200 million metric tons (Mt) with 45.75% aluminum oxide. Continental Resources held 50% of the rights to the deposit (Balaton Power Inc., 2003).

Hindalco resumed operations at one of its bauxite mines, the Gurdari Mine in Jharkland, which stopped production because of equipment damage in December 2002. The mine supplied 10% of the company's bauxite needs. Hindalco was in the process of expanding the capacity of its aluminum smelter at Renukoot in Uttar Pradesh by 100,000 t/yr to 342,000 t/yr. The project was scheduled for completion in September 2003 (Reuters, 2003a§). The company planned to raise capacity further to 360,000 t/yr by March 2005 by removing bottlenecks, adding equipment, and installing a 41-megawatt (MW) power unit.

The State Government of Orissa withdrew its consent for Balco to lease the Sashubahumali-Pasangamali bauxite mines in Kashipur, Rayagada District, because Balco failed to agree to set up a greenfield alumina refinery in Orissa. Sterlite Industries Ltd. owned 51% of Balco. Sterlite Industries also proposed to build a $735 million 1-Mt/yr alumina refinery in the Kalahandi

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District based on another bauxite deposit near the Langigarh bauxite mines (Mining Journal, 2003c).

Gujarat Alumina & Bauxite Ltd. (GABL) planned to set up a 100,000-t/yr aluminum smelter to complement its proposed 750,000-t/yr alumina refinery, which would use the bauxite deposits in Gujarat. Jefferies & Co. and Ambassador Group International, both of the United States, owned a 45% stake in GABL; the public and promoters owned the remaining 55%. The proposal also called for setting up a 100-MW captive powerplant and a 1.15-Mt/yr metallurgical coke unit. Total investment in the project was $730 million (Projects Today, 2003a§).

Indal deferred the closure of its 14,000-t/yr aluminum smelter at Alupurram in Kerala because the State Government agreed to reduce the power tariff on the plant. Indal also had an extrusion plant at Alupurram. The company planned to explore the possibility of setting up a captive coal-based powerplant of 30 MW at a cost of $22 million or importing power from Orissa where Indal had a captive powerplant (Metal Bulletin, 2003c).

The Government decided to sell its remaining 36% stake in Balco. Sterlite Industries had purchased 51% from the Government's then 87% stake in Balco in 2001. Balco had a capacity to produce 100,000 t/yr of aluminum (Metal Pages, 2003c§).

Chromium.—A proposed joint-venture project was to exploit the Tangarpada chromite mines that covered 550 hectares in the Sukinda area in Orissa and contained ore reserves of 20 Mt. Jindal Strips won the mining rights and an 89% interest in the project; the remaining 11% share was to be held by Industrial Development Corp. of Orissa Ltd. (IDCOL). IDCOL operated a 15,000-t/yr ferrochrome plant at Jaipur Road in Orissa and held mining rights for chromite at the Tailangi mines (Metal Bulletin, 2003h).

Copper.—The feed requirements of Indian primary copper producers were met by indigenous copper ore and imported concentrates. Only Hindustan Copper Co. Ltd. (HCL) mined low-grade copper ore from underground mines in addition to importing copper concentrates. Sterlite Industries and Birla Copper used imported concentrates. Total copper production capacity in India was 347,500 t/yr.

Annual demand for copper for the next 5 years was expected to increase by 8% to 8.5%. Indigenous metal production capacity was expected to increase to 600,000 t/yr. Exports of copper and copper alloy semimanufactures and industrial products were on the rise. The import of refined metal was expected to continue its downward trend, whereas import of copper scrap was likely to continue to rise (Metal Pages, 2003a§).

HCL's Khetri copper mines in Rajasthan were uneconomic and could be closed or have the current workforce of 9,000 reduced to 2,600. The mines had a combined capacity of 12,000 t/yr of copper in concentrate. The Khetri copper complex also included a smelter and a refinery with a capacity of 31,000 t/yr of copper cathode. The mines had minable reserves of 10.77 Mt at a grade of 1.15% copper; the cost to develop and exploit the reserves, however, was too high. HCL was up for privatization. Potential buyers were Birla Copper and Sterlite Industries (Metal Bulletin, 2003b).

The Government revived plans to privatize HCL by selling its entire 98.95% holding in the company. HCL's total copper capacity accounted for 12% of the Indian copper-cathode market. In addition to the Khetri copper complex, the company owned the copper complex in Jharkhand that comprised the Surda Mine and a smelter-refinery at Ghatsila that had a capacity of 16,500 t/yr of copper cathode. HCL also owned the Malanjkhand open pit copper mine in Madhya Pradesh with a capacity of 20,000 t/yr of copper in concentrate. In Maharashtra, HCL owned the Taloja copper-rod plant that had a capacity of 60,000 t/yr of continuous-cast rod (Mining Journal, 2003a).

Expansion of Birla Copper's Dahej smelter in Gujarat to 250,000 t/yr was expected to be completed in 2003. The company currently required 600,000 t/yr of copper concentrates, which could rise to 1 Mt/yr when the expansion is complete. Birla Copper received its concentrate supplies from North America and South America. About 80% of concentrate supplies was acquired through long-term contracts, and 20% was obtained on a spot basis (Metal Bulletin, 2003a).

Iron and Steel.—Mineral Enterprise Ltd., which was an iron ore producer and exporter in the Bellary Hospet region, had a license to mine up to 50 Mt of iron ore. The company sought to sell 24% of its equity shares to Cargill Exports of the United States and Kanematsu Corp. of Japan. Cargill and Kanematsu wanted tie-ups to secure their ore supplies. In 2003, Mineral Enterprises sold 400,000 metric tons (t) of iron ore in the domestic market, mostly to Visvesvaraya Iron and Steel and Kudremukh Iron Ore Co. Ltd.'s pig iron plant, and exported 800,000 t, which included 60,000 t sent to China from New Mangalore Port. The ore would be purchased by Kanematsu on behalf of Baosteel of China (Metal Bulletin, 2003e).

Tata Iron and Steel Co. Ltd. planned to expand its steel production capacity in Jharkland in two phases. During the first phase, capacity would increase to 5 Mt/yr from 4 Mt/yr at a cost of $435 million; during the second phase, to 6.5 Mt/yr at a cost of $544 million. The company also planned to increase its iron ore capacity to 11 Mt/yr from 7.5 Mt/yr, its pyroxenite capacity to 0.4 Mt/yr from 0.3 Mt/yr, and its coal capacity to 12 Mt/yr from 9 Mt/yr during the first phase at a cost of $195 million. During the second phase, the production capacities of iron ore, pyroxenite, and coal would be increased to 13 Mt/yr, 0.5 Mt/yr, and 15 Mt/yr, respectively, at a cost of $348 million (Projects Today, 2003b§).

Jindal Steel and Power Ltd. was to double its hot-briquetted-iron capacity to 1.3 Mt/yr during the next 3 years. The $120 million expansion also included the cost of increasing power generation capacity by 50 MW. The project was due for completion in September 2005. The company also planned to add 750,000 t/yr of long products capacity by March 2005 (Metal Bulletin, 2003g).

Monnet Ispat Ltd., which was a leading producer of direct-reduced iron (DRI) in India, was expanding its DRI operations by building kilns that could boost capacity by 440,000 t/yr at a cost of $49.5 million. The plant would be located close to a coal mine to reduce the cost of obtaining raw material (Metal Bulletin, 2003f).

Maharashtra Elektrosmelt, which was India's largest manganese-ferroalloys producer, shut down one of its two 32-megavoltampere furnaces after a transformer burned out at its Chandrapur plant. The furnace, which produced about 48,000 t/yr of high-carbon ferromanganese, would be idled for 6 months. Meanwhile, Chattisgarh Power Co. was adding two furnaces; the first was scheduled to become operational in June and would have a capacity of 15,000 t/yr of high-carbon ferromanganese. Indsil Electrosmelts restarted two furnaces previously idled by Nava Bharat Ferroalloys; the furnaces had capacities of 4,000 t/yr of silicomanganese and 4,000 t/yr of high-carbon ferromanganese, respectively (Metal Bulletin Research, 2003).

Lead and Zinc.—India's demonstrated reserves of lead and zinc ores were estimated to be 176.8 Mt that contained 2.38 Mt of lead and 9.7 Mt of zinc. The smelting capacities of primary lead and zinc were 43,000 t/yr from Hindustan Zinc Ltd. (HZL) and 199,000 t/yr from Binani Industries Ltd. and HZL, respectively. In addition, secondary lead and zinc were produced from dross, residue, and scrap.

HZL planned to double the capacity of its lead and zinc smelters at Chanderiya, Rajasthan, from 43,000 t/yr and 169,000 t/yr, respectively, to 86,000 t/yr and 338,000 t/yr. It also planned to expand the capacity of its beneficiation plant at the Rampura Agucha lead and zinc mine in Rajasthan to 3.75 Mt/yr from 2 Mt/yr, and to set up a 150-MW powerplant. HZL chose state-owned Bharat Heavy Electricals Ltd. to construct the $86.7 million powerplant. The expansion of the smelters was expected to be commissioned in September 2004. HZL was managed by Sterlite Industries, which had acquired a controlling stake in HZL from the Government in 2002 under a privatization program (Metal Pages, 2003b§).

Industrial Minerals

Cement.—India's demand for cement could not keep up with its capacity buildup. In 2003, the first phase of the National Highways Development Project was estimated to generate cement demand of 10 Mt. The growth of the housing sector also gradually increased the demand for cement. A demand growth of 5% was anticipated during 2004. The country's total cement production was about 100 Mt in 2003 owing to a recovery in capital expenditure. Lafarge S.A. of France acquired a cement production capacity of 5 Mt/yr in India (Building Bulletin, 2003).

Larsen & Toubro Ltd. (L&T) of India decided to spin off its cement business into a new company called CemCo. L&T held 20% of the equity of CemCo and the balance was distributed to L&T's shareholders. Subsequently, Grasim Industries Ltd. acquired an 8.5% stake of CemCo from L&T and made an open offer for 30% of the equity of CemCo with a view toward taking management control. The transaction was expected to strengthen CemCo's ability to compete in the Indian and overseas markets (Larsen & Toubro Ltd., 2003§).

Orissa Cement Ltd. ordered a 250-metric-ton-per-hour cement mill, which was the company's third vertical roller mill, for cement and slag grinding. It was equipped with six rollers and was identical to the two mills that were already in operation. The mill was scheduled to start production in September 2004 (World Cement, 2003).

Diamond.—Dwyka Diamonds Ltd. of Australia explored for diamond in India with some encouraging results. The Phase 2 sampling program of AMIL License A and B areas was successful with five high priority targets identified away from the four known pipes. Ground magnetic surveys completed within the priority 003 and 017 drainages highlighted seven magnetic targets. Ground magnetic surveys were being carried out over new targets in the Chigucherla East and the priority 022 drainage areas (Dwyka Diamonds Ltd., 2003§).

Nitrogen (Fertilizers).—IFFCO suspended production at its 1,650-metric-ton-per-day urea plant in Kalol in March owing to a shortage in natural gas feedstock. The plant, which used naphtha and natural gas interchangeably, served the markets in Gujarat, Madhya Pradesh, Maharashtra, and Rajasthan. High naphtha prices made it unviable for IFFCO's Kalol plant to switch to naphtha for feedstock (Fertilizer Week, 2003b).

Salt.—India has achieved self-sufficiency in salt for human consumption and industry and was a salt exporter. The State of Gujarat was the center of India's salt industry and accounted for 73% of total production (Washington Post, The, 2003). A small amount of rock salt was produced by Hindustan Salts Ltd. at the Guma Mine in the Mandi District of Himachal Pradesh.

Mineral Fuels

Coal.—The privatization of coal mines remained uncertain. The Coal Mines Nationalization (Amendment) Bill, which would allow private sector coal mining, was not scheduled to be discussed in the winter session of the Parliament. In 2003, private sector investment was needed in the coal industry, and funds from the Government for increasing coal production to meet the growing demand were lacking. India's demand for coal was expected to increase to 460 Mt in 2004, and production was expected to increase only to 405 Mt. The nationalized coal companies and private investors would work to fulfill the country's needs (Coal Age, 2003).

Coal India Ltd. found nine new reserves of coalbed methane gas of about 440 billion cubic meters in seven States. About 182.3 billion cubic meters of gas reserves were found in lignite deposits of Rajasthan and about 87.2 billion cubic meters were found in Gujarat. Methane deposits also were found in Jharkhand (54 billion cubic meters), Chattisgarh (33.9 billion cubic meters), Andhra Pradesh (29.7 billion cubic meters), Madhya Pradesh (29.3 billion cubic meters), and Maharashtra (19.9 billion cubic meters) (Alexander's Gas & Oil Connections, 2003a§).

Natural Gas.—Niko Resources and Reliance Industries made a huge gas discovery in block D6, which is located 26 kilometers (km) off the east coast of India. The D1 exploration well encountered in excess of 100 meters (m) of net gas pay in depth. With the first six wells drilled, the estimated in-place gas reserves for the block were 295 billion cubic meters. A 2,500-square-kilometer three-dimensional seismic survey would be shot in October to identify targets for a second drilling program. Niko Resources had a 10% working interest in the project (Rigzone.com, 2003b§).

The Andaman and Nocobar Islands in the Bay of Bengal were the setting for vast unexplored natural gas resources estimated to be approximately 610 Mt of oil and oil-equivalent gas. Fresh seismic surveys had upwardly revised the estimated resources from 180 Mt of oil and oil-equivalent gas. Two blocks in the Andaman region were among 24 oil and gas blocks on offer in the fourth new exploration licensing round (Rigzone.com, 2003a§).

India agreed to import liquefied natural gas (LNG) in phases from Iran under a 25-year contract and would receive 2.5 Mt in fiscal year 2007-08 and 5 Mt/yr beginning in 2012. The Government was expected to build a fourth LNG import terminal on the country's west coast to receive and process the LNG. Indian Oil Corp. also renewed its contract with National Iranian Oil Corp. to import 5 Mt of crude oil during fiscal year 2003-04 (Oil & Gas Journal, 2003b).

Petronet LNG, which was the State-owned LNG consortium, planned to double the capacity of its LNG receiving terminal at Dahej in the State of Gujarat to 10 Mt/yr in response to an expected rise in LNG demand in India. Work was nearing completion on the 5-Mt/yr Dahej terminal. Petronet also could construct a 2.5-Mt/yr LNG terminal at Kochi in the State of Kerala. Petronet was hopeful that National Thermal Power Corp. would buy 3 Mt/yr of LNG and negotiated with its supplier for a reduction in the price of the LNG. In addition, the Government reduced the customs duty on the importation of regasification plants and machinery to 5% from 25% (Oil & Gas Journal, 2003c).

A joint Indo-Iran panel proposed the following options to transport natural gas from Iran to India: a land pipeline, a deep-sea pipeline, and sea tankers. Both countries studied the feasibility of onshore and offshore pipelines. The proposed $3.5 billion land pipeline would run 2,600 km from Iran, through the Pakistani Province of Sindh, to India. The offshore gas pipeline would run from the Assaluyen Gasfield in southern Iran to India and would bypass the exclusive economic zone of Pakistan. The Government of India favored the underwater pipeline to avoid potential disruptions in supplies (Alexander's Gas & Oil Connections, 2003b§).

Petroleum.—Oil and Natural Gas Corp. (ONGC) planned to begin a $390 million deepwater exploration campaign and expected to spend $1.2 billion per year thereafter in exploration activities to increase its crude oil production from deepwater fields. ONGC also awarded a $137 million 3-year contract to Transocean Inc. of the United States for its *Discoverer Seven Seas* deepwater ship to drill offshore India. The ship was capable of drilling in water as deep as 2,130 m. The project was expected to begin in the first quarter of 2004 (Oil & Gas Journal, 2003a).

During the past 3 years, discoveries of oil and gas added 300 Mt of oil and oil-equivalent gas to India's hydrocarbon reserves. They included the gas finds by Reliance Industries in the deep waters of Krishna Godavari Basin, by Cairn Energy of the United Kingdom in the same area, and by Niko Resources in an onland block in Surat, Gujarat. ONGC also made a large offshore oil and gas discovery west of Bassein Field (Alexander's Gas & Oil Connections, 2003c§).

Bharat Petroleum Corp. Ltd., which was to be privatized through a public offering, would complete its 6-Mt/yr refinery at Bina, Madhya Pradesh, on its own at a cost of $1.34 billion. Bharat had been cleared to increase its equity in the refinery from 26% to 50%. Oman Oil would hold 2% of the refinery's equity, and the balance would be raised from financial institutions and the public (Petroleum Economist, 2003).

Indian Oil Corp. launched its Panipat refinery expansion and paraxylene/purified terephthalic acid (PTA) project at a combined investment of about $2.2 billion. The 6-Mt/yr Panipat refinery in the State of Haryana would be expanded to a capacity of 12 Mt/yr with matching processing facilities. The paraxylene/PTA project, which was expected to cost $1.12 billion, was to manufacture PTA and paraxylene from naphtha. Naphtha would be sourced from the Panipat refinery and the company's Mathura refinery in the State of Uttar Pradesh. The paraxylene/PTA plant was scheduled for commissioning in the first quarter of 2004 (Platts News, 2003§).

Infrastructure

Chennai Port Trust shifted its coal handling to the new Ennore Port. Meanwhile, a memorandum of understanding was signed between Chennai Port Trust and Chennai Petroleum Corp. Ltd. for a period of 30 years to handle petroleum products at concession rates. Chennai Petroleum planned to increase its crude oil processing capacity to 9.5 Mt/yr from 6 Mt/yr (Times of India, 2003§).

Outlook

India's economic growth in terms of GDP is expected to increase slightly to 6% in 2004. The country's mining activities are expected to remain at about the same level as those of 2003. Production of aluminum is expected to increase because of the capacity expansion at Hindalco's aluminum smelter. Increasing imports of copper concentrates from North America and South America are foreseen to satisfy the need of the expanded copper smelters. Output of steel also is expected to increase gradually owing to Tata's planned capacity expansion. HZL's completed expansion of its lead and zinc smelters in late 2004 will add a significant amount of lead and zinc metals to the domestic market. Offshore exploration activities are expected to intensify during the next 2 years with the encouragement of some success in the discovery of oil and gas.

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TABLE 1

INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		1999	2000	2001	2002	2003
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	6,712 [4]	7,562 [4]	7,864 [4]	9,647 [r, 4]	10,002 [4]
Alumina, Al_2O_3 equivalent	do.	2,080	2,280	2,400	2,800	2,500
Metal, primary		614,400 [4]	643,700 [4]	624,000 [4]	671,200 [4]	798,300 [4]
Cadmium metal		269 [4]	314 [4]	436 [4]	466 [4]	477 [4]
Chromium, chromite, gross weight		1,472,766 [4]	1,946,910 [4]	1,677,924 [4]	1,900,000	1,800,000
Cobalt metal		120	206 [4]	250	270	255
Copper:						
Mine output, Cu content		34,100 [4]	31,900 [4]	32,400 [4]	31,500 [r, 4]	28,400 [4]
Metal, primary:						
Smelter		224,400 [4]	256,000 [4]	293,000 [4]	251,400 [4]	252,000 [4]
Refinery						
Electrolytic, cathode		200,000	234,000 [4]	310,000 [4]	353,700 [4]	375,000 [4]
Fire refined		8,000	9,000	18,000	20,000	19,000
Total		208,000	243,000	328,000	374,000	394,000
Gold metal, smelter	kilograms	2,500 [4]	6,200 [4]	3,700 [4]	3,800 [4]	3,100 [4]
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	70,220 [4]	75,950 [4]	79,200 [4]	80,000	85,000
Fe content	do.	44,940 [4]	48,600 [4]	50,700 [4]	51,200	54,400
Metal:						
Pig iron	do.	20,139 [4]	21,321 [4]	21,900 [4]	24,315 [r, 4]	24,000
Direct-reduced iron	do.	5,220 [4]	5,440 [4]	5,590 [4]	5,731 [r, 4]	5,800
Ferroalloys:						
Ferrochromium, including charge chrome		312,140 [4]	376,693 [4]	266,395 [4]	311,927 [4]	300,000
Ferrochromiumsilicon		10,000	10,000	10,000	10,000	10,000
Ferromanganese		160,000	160,000	165,000	165,000	165,000
Ferrosilicon		55,000	60,000	50,000	52,000	54,000
Silicomanganese		190,000	185,000	150,000	150,000	160,000
Other		9,000	9,000	9,000	9,000	9,000
Steel, crude	thousand tons	24,269 [4]	26,924 [4]	27,291 [4]	28,814 [4]	31,779 [4]
Semimanufactures[5]	do.	12,000	12,000	13,000	13,500	14,000
Lead:						
Mine output, Pb content		32,100 [4]	28,900 [4]	25,600 [4]	28,600 [r, 4]	33,100 [4]
Metal, refined:						
Primary		72,000	57,400 [r, 4]	74,400 [r, 4]	64,200 [r, 4]	61,500 [4]
Secondary		20,000	20,500 [r, 4]	22,000 [r, 4]	25,000 [r, 4]	24,800 [4]
Total		92,000	77,900 [r, 4]	96,400 [r, 4]	89,200 [r, 4]	86,300 [4]
Manganese:						
Ore and concentrate, gross weight	thousand tons	1,500	1,550	1,600	1,700	1,650
Mn content	do.	570	590	600	630	620
Rare-earth metals, monazite concentrate, gross weight		5,000	5,000	5,000	5,000	5,000
Selenium	kilograms	11,500	11,500	11,500	11,500	12,000
Silver, mine and smelter output	do.	54,000	40,000	49,500 [4]	52,100 [4]	53,600 [4]
Titanium concentrates, gross weight:						
Ilmenite		378,000	380,000	430,000	460,000	500,000
Rutile		16,000	17,000	19,000	18,000	18,000
Zinc:						
Mine output, concentrate:						
Gross weight		265,000	264,000	270,000	234,300 [r, 4]	294,200 [4]
Zn content		145,000	144,000	146,000	129,000 [r]	162,000
Metal:						
Primary		175,000	176,000	207,000 [r, 4]	231,400 [r, 4]	253,900 [4]
Secondary		25,000	25,000	25,000	24,000	24,000
Total		200,000	201,000	232,000 [r]	255,000 [r]	278,000
Zirconium concentrate, zircon, gross weight		19,000	19,000	19,000	19,000	20,000

See footnotes at end of table.

TABLE 1--Continued

INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		1999	2000	2001	2002	2003
INDUSTRIAL MINERALS						
Abrasives, natural, n.e.s.:						
Corundum, natural	kilograms	1,300	1,250	1,200	1,200	1,150
Garnet		135,000	130,000	125,000	120,000	120,000
Jasper		7,000	7,500	8,000	8,000	8,500
Asbestos		20,000	21,000	21,000	18,000	19,000
Barite		360,000	840,000	850,000	600,000	700,000
Bromine, elemental		1,500	1,500	1,500	1,500	1,500
Cement, hydraulic	thousand tons	90,000	95,000	100,000	100,000	100,000
Chalk		115,000	110,000	110,000	110,000	115,000
Clays:						
Ball clay		380,000	375,000	370,000	400,000	390,000
Diaspore		12,000	13,000	13,000	12,000	12,000
Fireclay		340,000	345,000	350,000	355,000	360,000
Kaolin:						
Salable crude	thousand tons	520	530	540	540	550
Processed	do.	150	160	170	170	180
Total	do.	670	690	710	710	730
Other	do.	65	70	70	70	75
Diamond:						
Gem	thousand carats	12	16	17	17	16
Industrial	do.	29	41	43	45	44
Total	do.	41	57	60	62	60
Feldspar		105,000	110,000	110,000	110,000	150,000
Fluorspar:						
Concentrates, metallurgical-grade		800	3,253 [r, 4]	6,900 [r, 4]	4,188 [r, 4]	4,200
Other fluorspar materials, graded		5,600	3,782 [r, 4]	13,866 [r, 4]	6,296 [r, 4]	6,300
Gemstones, excluding diamond:						
Agate, including chalcedony pebble		200	250	250	200	200
Garnet	kilograms	900	850	900	700	800
Graphite[6]		145,000	140,000	140,000	130,000	110,000
Gypsum		2,200,000	2,210,000	2,250,000	2,300,000	2,300,000
Kyanite and related materials:						
Kyanite		5,000	5,000	5,500	6,000	6,000
Sillimanite		12,000	12,000	13,000	14,000	14,000
Lime		300,000	310,000	320,000	310,000	310,000
Magnesite		360,000	365,000	370,000	380,000	380,000
Mica:						
Crude		1,500	1,500	1,300	1,500	1,600
Scrap and waste		1,000	950	1,100	2,000	2,000
Total		2,500	2,450	2,400	3,500	3,600
Nitrogen, N content of ammonia	thousand tons	10,376 [4]	10,148 [4]	10,081 [4]	9,827 [r, 4]	9,708 [4]
Phosphate rock, including apatite		1,262,000 [4]	1,136,000 [4]	1,200,000	1,250,000	1,180,000
Pigments, mineral, natural, ocher		380,000	336,000	355,000	360,000	365,000
Pyrites, gross weight		100,000	105,000	110,000	115,000	115,000
Salt:						
Rock salt	thousand tons	3	3	3	3	3
Other	do.	14,450 [4]	14,450 [4]	14,500	14,500	15,000
Total	do.	14,500	14,500	14,500	14,500	15,000
Sand:						
Calcareous	do.	235	240	245	250	250
Silica	do.	1,300	1,350	1,400	1,400	1,500
Other	do.	2,900	2,800	2,900	2,800	2,900

See footnotes at end of table.

TABLE 1--Continued
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		1999	2000	2001	2002	2003
INDUSTRIAL MINERALS--Continued						
Slate		10,000	10,500	11,000	10,000	10,500
Soda ash		1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Stone, sand and gravel:						
Calcite		50,000	50,500	51,000	51,000	52,000
Dolomite	thousand tons	2,700	2,750	2,800	2,900	2,900
Limestone	do.	110,000	105,000	110,000	115,000	120,000
Quartz and quartzite	do.	265	260	270	250	250
Sulfur, byproduct from fertilizer plants		10,500	11,000	11,000	11,500	11,500
Talc and related materials:						
Pyrophyllite		85,000	85,000	86,000	85,000	86,000
Steatite, soapstone		535,000 [r]	545,000 [r]	546,000 [r]	550,000 [r]	552,000
Vermiculite		4,000	4,200	4,300	4,300	4,400
Wollastonite		96,000	100,000	100,000	105,000	120,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	290,400 [4]	310,800 [4]	320,500 [4]	325,000	328,000
Liginte	do.	24,000	24,000	23,000	24,000	25,000
Total	do.	314,400 [4]	334,800 [4]	343,500 [4]	349,000	353,000
Gas, natural:						
Gross	million cubic meters	31,400 [4]	30,000	25,519 [4]	26,000	27,000
Marketable	do.	29,500	28,500	24,000	25,000	25,000
Petroleum:						
Crude	thousand 42-gallon barrels	241,119 [4]	238,068 [4]	239,292 [4]	240,000	241,000
Refinery products:						
Liquefied petroleum gas	do.	41,000	41,500	42,000	43,000	44,000
Gasoline	do.	40,000	40,500	41,000	42,000	42,000
Kerosene and jet fuel	do.	58,500	59,000	58,000	60,000	59,000
Distillate fuel oil	do.	168,000	169,000	170,000	172,000	171,000
Residual fuel oil	do.	69,000	68,000	67,000	69,000	70,000
Other	do.	91,000	91,500	92,000	94,000	93,000
Total	do.	468,000	470,000	470,000	480,000	479,000

[r] Revised.

[1] Table includes data available through July 15, 2004.

[2] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[3] In addition to commodities listed, other gemstones (aquamarine, emerald, ruby, and spinel) and uranium are produced, but output is not reported; available information is inadequate to make reliable estimates of output levels.

[4] Reported figure.

[5] Excludes production from steel miniplants.

[6] India's marketable production is 10% to 20% of mine production.

TABLE 2
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Alumina	Indian Aluminium Co. Ltd. [Indian interests, 60.4%; Alcan Aluminium Ltd. (Canada), 39.6%]	Belgaum Refinery, Karnataka	280
Do.	National Aluminium Co. Ltd. (Indian Government, 100%)	Dhamanjodi Refinery, Orissa	1,050
Do.	Bharat Aluminium Co. Ltd. (Indian Government, 49%; Sterlite Industries Ltd., 51%)	Korba Refinery, Chhattisgarh	200
Do.	Utkal Alumina International Ltd. [Norsk Hydro A/S (Norway), 45%; Alcan Aluminium Ltd. (Canada), 35%; Hindalco Industries Ltd., 20%]	Koraput Refinery, Orissa	1,000 [1]
Do.	Madras Aluminium Co. Ltd. [Alumix SpA (Italian Government), 27%; R. Prabhu and Associates, 24%; Tamil Nadu Industrial Investment Corp., 11%; others, 38%]	Mettur Refinery, Tamil Nadu	60
Do.	Indian Aluminium Co. Ltd. [Indian interests, 60.4%; Alcan Aluminium Ltd. (Canada), 39.6%]	Muri Refinery, Jharkhand	88
Do.	Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot Refinery, Uttar Pradesh	450
Aluminum	Indian Aluminium Co. Ltd. [Indian interests, 60.4%; Alcan Aluminium Ltd. (Canada), 39.6%]	Alupuram Smelter, Kerala	20
Do.	National Aluminium Co. Ltd. (Indian Government, 100%)	Angul Smelter, Orissa	230
Do.	Indian Aluminium Co. Ltd. [Indian interests, 60.4%; Alcan Aluminium Ltd. (Canada), 39.6%]	Belgaum Smelter, Karnataka	70
Do.	do.	Hirakud Smelter, Orissa	30
Do.	Bharat Aluminium Co. Ltd. (Indian Government, 49%; Sterlite Industries Ltd., 51%)	Korba Smelter, Chhattisgarh	100
Do.	Madras Aluminium Co. Ltd. [Alumix SpA (Italian Government), 27%; R. Prabhu and Associates, 24%; Tamil Nadu Industrial Investment Corp., 11%; others, 38%]	Mettur Smelter, Tamil Nadu	25
Do.	Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot Smelter, Uttar Pradesh	275
Bauxite	Bharat Aluminium Co. Ltd. (Indian Government, 49%; Sterlite Industries Ltd., 51%)	Amarkantak Mine, Madhya Pradesh	200
Do.	Indian Aluminium Co. Ltd. [Indian interests, 60.4%; Alcan Aluminium Ltd. (Canada), 39.6%]	Kolhapur District mines, Maharashtra	600
Do.	Gujarat Mineral Development Corp. (Gujarat State Government, 100%)	Kutch and Saurashtra Mines, Gujarat	500
Do.	Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Lohardarga District mines, Jharkland	750
Do.	Indian Aluminium Co. Ltd. [Indian interests, 60.4%; Alcan Aluminium Ltd. (Canada), 39.6%]	do.	200
Do.	National Aluminium Co. Ltd. (Indian Government, 100%)	Panchpatmali Hills, Koraput District mines, Orissa	2,400
Do.	Minerals & Minerals Ltd. (Indian Government, 100%)	Richuguta, Palamau District mines, Jharkland	200
Barite	Andhra Pradesh Mineral Development Corp. Ltd. (Andhra Pradesh State Government, 100%)	Cuddapah District mines, Andhra Pradesh	350
Do.	Associated Mineral Corp.	do.	75
Do.	Pragathi Minerals	do.	50
Do.	Shri C. M. Ram nath Reddy	do.	75
Do.	Vijaylaxmi Minerals Trading Co.	do.	50
Borax	Borax Morarji Ltd.	Ambernath, Maharashtra	17
Cement	Larsen and Toubro Ltd.	Awarpur Plant, Maharashtra	2,300
Do.	Century Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)	Baikunth Plant, Madhya Pradesh	1,120
Do.	Coromandel Fertilizers Ltd. [Chevron Chemical Co. (United States), 23.55%; International Minerals and Chemical Co., 20.89%; Parry and Co., 10.64%; E.I.D. Parry (India) Ltd., 6.65%; others, 38.27%]	Chilamkur Plant, Andhra Pradesh	1,000

See footnotes at end of table.

TABLE 2--Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement--Continued:		The Associated Cement Cos. Ltd. (Indian Government, 34.86%; private shareholders, 65.14%)	Gagal Plant, Himachal Pradesh	1,830
Do.		Raymond Cement Works (a division of Raymond Woolen Mills Ltd., J K Singhania, principal shareholder)	Gopalnagar Plant, Madhya Pradesh	1,250
Do.		Narmada Cement Co. Ltd. (Chowgule and Co. Ltd., 34%; Gujarat State Government, 17.33%; others, 48.67%)	Jafrabad Plant, Gujarat	1,000
Do.		Rajashree Cement (a division of Indian Rayon and Industries Ltd., 100%)	Khor Plant, Karnataka	1,020
Do.		The Associated Cement Cos. Ltd. (Indian Government, 34.86%; private shareholders, 65.14%)	Kymore Plant, Madhya Pradesh	1,500
Do.		Mangalam Cement Ltd.	Morak Plant, Rajasthan	1,000
Do.		Mysore Cements Ltd. (Government institutions and banks, 41.13%; Corporate Trust Holdings, 21.70%; others, 37.17%)	Narasingarh Plant, Madhya Pradesh	1,089
Do.		Cement Corp. of India Ltd. (Indian Government, 100%)	Nayagaon Plant, Madhya Pradesh	1,330
Do.		J K Cement Works (a division of J K Synthetics Ltd., 100%)	Nimbahera Plant, Rajasthan	1,462
Do.		The India Cement Co. Ltd. (Indian Government, 26%; Life Insurance Corp. of India, 24%; others, 50%)	Sankarnagar Plant, Tamil Nadu	1,000
Do.		Maihar Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)	Satna Plant, Madhya Pradesh	1,800
Do.		Shree Digvijay Cement Co. Ltd.	Shreeniwas Plant, Maharashtra	1,060
Do.		Lakshmi Cement (a division of Straw Products Ltd., J K Singhania, principal shareholder)	Sirohi Plant, Rajasthan	1,400
Do.		Manikgarth Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)	Tehsil Rajura Plant, Maharashtra	1,000
Do.		Vasavadatta Cement (Kesoram Industries Ltd., 100%)	Vasavadatta Plant, Karnataka	1,000
Do.		Vikram Cement (Grasim Industries Ltd., a subsidiary of Birla Group, 100%)	Vikram Plant, Madhya Pradesh	1,000
Do.		Raasi Cement Ltd. (Andhra Pradesh Government, 50%, and Development Co. Ltd., 50%)	Vishnupuram Plant, Andhra Pradesh	1,000
Do.		The Associated Cement Cos. Ltd. (Indian Government, 34.86%; private shareholders, 65.14%)	Wadi Plant, Karnataka	2,180
Chromite		Ferro Alloys Corp. Ltd.	Cuttack District, Orissa	120
Do.		Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	300
Do.		Tata Iron and Steel Co. Ltd.	do.	100
Do.		Ferro Alloys Corp. Ltd.	Dhenkanal District, Orissa	75
Do.		Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	200
Do.		Mysore Minerals Ltd.	Hassan District, Karnataka	125
Do.		Ferro Alloys Corp. Ltd.	Kendujhar District, Orissa	75
Do.		Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	100
Do.		Ferro Alloys Corp. Ltd.	Khammam District, Andhra Pradesh	100
Coal, bituminous	million tons	Bharat Coking Coal Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Bihar and West Bengal	26
Do.	do.	Central Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Bihar	27
Do.	do.	Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Bihar and West Bengal	21
Do.	do.	Mahanadi Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Orissa	21
Do.	do.	North Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Assam	640
Do.	do.	Northern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Madhya Pradesh and Uttar Pradesh	24
Do.	do.	Singareni Collieries Co. Ltd. (Andhra Pradesh State Government, 50%, and Indian Government, 50%)	Andhra Pradesh	18
Do.	do.	South Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Madhya Pradesh	36

See footnotes at end of table.

TABLE 2--Continued

INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Coal, bituminous--Continued: million tons	Western Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Madhya Pradesh and Maharashtra	18
Coal, lignite do.	Neyveli Lignite Corp. Ltd. (Indian Government, 100%)	Tamil Nadu	17
Copper, mine	Hindustan Copper Co. Ltd. (Indian Government, 100%)	Indian Copper Complex mines, Ghatsila District, Bihar	31
Do.	do.	Khetri Copper Complex mines, Khetrinagar Rajasthan	15
Do.	do.	Malanjkhand Copper Complex mines, Balaghar District, Madhya Pradesh	22
Copper, metal	Birla Copper	Birla Copper Complex smelter, Dahej, Gujarat	150
Do.	Hindustan Copper Co. Ltd. (Indian Government, 100%)	Indian Copper Complex smelter-refinery, Ghatsila District, Bihar	20
Do.	do.	Khetri Copper Complex smelter-refinery, Khetrinagar District, Rajasthan	45
Do.	Sterlite Industries Ltd.	Tuticorin Smelter, Tamil Nadu	150
Ilmenite-rutile ore	Kerala Minerals and Metals Ltd. (Kerala State Government, 100%)	Chavara, Kerala	100
Do.	Indian Rare Earths Ltd. (Indian Government, 100%)	do.	200
Do.	do.	Ganjam, Orissa	220
Do.	do.	Manavalakurichi, Tamil Nadu	65
Do.	VV Minerals Ltd.	Kanyakumari, Tamil Nadu	130
Iron and steel:			
Crude steel	Visvesvaraya Iron and Steel Ltd. (Karnataka State, 60%; Steel Authority of India Ltd., Indian Government, 40%)	Bhadravati steel plant, Karnataka	180
Do.	Steel Authority of India Ltd. (Indian Government, 100%)	Bhilai steel plant, Madhya Pradesh	4,000
Do.	do.	Bokaro steel plant, Bihar	4,000
Do.	Indian Iron and Steel Co. Ltd. (wholly owned subsidiary of Steel Authority of India Ltd., Indian Government, 100%)	Burnpur steel plant, West Bengal	1,500
Do.	Steel Authority of India Ltd. (Indian Government, 100%)	Durgapur steel plant, West Bengal	1,600
Do.	Tata Iron and Steel Co. Ltd.	Jamshedpur steel plant, Bihar	3,200
Do.	Steel Authority of India Ltd. (Indian Government, 100%)	Rourkela steel plant, Orissa	1,800
Do.	Rashtriya Ispat Nigam Ltd.	Visakhapatnam steel plant, Andhra Pradesh	3,200
Do.	Ministeel plants (privately owned)	About 180 plants located throughout India	4,700
Iron ore	National Mineral Development Corp. Ltd. (Indian Government, 100%)	Bailadila, Madhya Pradesh	9,000
Do.	Steel Authority of India Ltd. (Indian Government, 100%)	Bastar and Durg District, Madhya Pradesh	7,000
Do.	Kudremukh Iron Ore Co. Ltd. (Indian Government, 100%)	Kudremukh, Chikmagalur District, Karnataka	10,300
Do.	National Mineral Development Corp. Ltd. (Indian Government, 100%)	Donimalai, Karnataka	9,000
Do.	Chowgule and Co. Ltd.	Goa	2,500
Do.	Dempo Mining Corp. Ltd.	do.	2,500
Do.	V.M. Salgaocar & Bros. Pvt. Ltd.	do.	2,500
Do.	Sesa Goa Ltd.	Codli and Sonshi, Goa	NA
Do.	Steel Authority of India Ltd. (Indian Government, 100%)	Kendujhar District, Orissa	3,000
Do.	Tata Iron and Steel Co. Ltd.	do.	2,000
Do.	Indian Iron and Steel Co. Ltd. (wholly owned subsidiary of Steel Authority of India Ltd., Indian Government, 100%)	Singhbhum District, Bihar	2,500
Do.	Steel Authority of India Ltd. (Indian Government, 100%)	do.	3,500
Do.	Tata Iron and Steel Co. Ltd.	do.	3,500
Kyanite	Associated Mining Co.	Bhandara District, Maharashtra	10
Do.	Maharashtra Mineral Corp. Ltd.	do.	10
Do.	Bihar State Mineral Development Corp. Ltd. (Bihar State Government, 100%)	Singhbhum District, Bihar	10
Do.	Hindustan Copper Co. Ltd. (Indian Government, 100%)	do.	22
Lead ore	Hindustan Zinc Ltd. (Indian Government, 100%)	Agnigundala Mine, Andhra Pradesh	72
Do.	do.	Sargipalli Mine, Orissa	150

See footnotes at end of table.

TABLE 2--Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Lead:			
Primary	Hindustan Zinc Ltd. (Indian Government, 100%)	Chanderiya Smelter, Rajasthan	35
Do.	do.	Tundoo Smelter, Bihar	8
Do.	do.	Chanderiya Smelter, Rajasthan	35
Secondary	Indian Lead Co.	Thane Refinery, Mumbai, Maharashtra	25
Do.	do.	Wada, Mumbai, Maharashtra	40
Lead-zinc ore	do.	Rampura-Agucha Mine, Rajasthan	1,300
Do.	do.	Zawar mine group, Rajasthan	1,200
Magnesite	Burn Standard Co. Ltd. (Indian Government, 100%)	Salem, Tamil Nadu	150
Do.	Dalmia Magnesite Corp.	do.	150
Do.	Tamil Nadu Magnesite Ltd. (Tamil Nadu State Government, 100%)	do.	150
Manganese ore[2]	Manganese Ore India Ltd. (Indian Government, 100%)	Adilabad, Andhra Pradesh	NA
Do.	Falechand Marsingdas	Andhra Pradesh	NA
Do.	Manganese Ore India Ltd. (Indian Government, 100%)	Balaghat, Madhya Pradesh	NA
Do.	J.A. Trivedi Bros.	do.	NA
Do.	Sandur Manganese and Iron Ores Ltd.	Bellary, Karnataka	NA
Do.	Manganese Ore India Ltd. (Indian Government, 100%)	Bhandara, Maharashtra	NA
Do.	Eastern Mining Co.	North Kanara, Karnataka	NA
Do.	Mysore Minerals Ltd.	do.	NA
Do.	Manganese Ore India Ltd. (Indian Government, 100%)	Keonjhar, Orissa	NA
Do.	Mangilah, Rungta (Pvt.) Ltd.	do.	NA
Do.	Orissa Mining Corp. Ltd.	do.	NA
Do.	Rungta Mines (Pvt.) Ltd.	do.	NA
Do.	Serajuddin & Co.	do.	NA
Do.	S. Lall & Co.	do.	NA
Do.	Tata Iron and Steel Co. Ltd.	do.	NA
Do.	Orissa Mineral Development Co. Ltd.	Koraput, Orissa	NA
Do.	Orissa Mining Corp. Ltd.	do.	NA
Do.	Mysore Minerals Ltd.	Shimoga, Karnataka	NA
Do.	Aryan Mining & Trading Corp.	Sundargarh, Orissa	NA
Do.	Orissa Manganese & Minerals (Pvt.) Ltd.	do.	NA
Do.	Tata Iron and Steel Co. Ltd.	do.	NA
Do.	R.B.S. Shreeram Durga Prasad and Falechand Marsingdas	Vizianagaram, Andhra Pradesh	NA
Petroleum, refined products thousand 42-gallon barrels per day	Cochin Refineries Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 55%; private interests, 45%)	Ambalamugal Refinery, Kerala	93,000
Do.	Indian Oil Corp. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 91%; private interests, 9%)	Barauni Refinery, Bihar	66,000
Do.	Bongaigaon Refinery and Petrochemicals Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 100%)	Bongaigaon Refinery, Assam	27,000
Do.	Indian Oil Corp. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 91%; private interests, 9%)	Digboi Refinery, Assam	12,000
Do.	do.	Guwahati Refinery, Assam	20,000
Do.	do.	Haldai Refinery, West Bengal	61,000
Do.	do.	Koyali Refinery, Gujarat	185,000
Do.	Madras Refineries Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 52%; private interests, 48%)	Madras Refinery, Tamil Nadu	131,000
Do.	Bharat Petroleum Corp. Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 67%; private interests, 33%)	Mahul Refinery, Mumbai, Maharashtra	135,000
Do.	Industan Petroleum Corp. Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 51%; private interests, 49%)	do.	110,000
Do.	do.	Visakhapatnam Refinery, Andhra Pradesh	90,000
Do.	Indian Oil Corp. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 91%; private interests, 9%)	Mathura Refinery, Uttar Pradesh	156,000
Do.	do.	Panipat Refinery, Haryana	120,000

See footnotes at end of table.

TABLE 2--Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Phosphate rock[3]	Rajasthan State Mineral Development Corp. Ltd. (Rajasthan State Government, 100%)	Badgaon, Dakankotra, Kanpur, Kharbaria-ka-Guda, and Sallopat Mines, Rajasthan	NA
Do.	Pyrites Phosphates and Chemicals Ltd.	Durmala and Maldeota underground mines, Uttar Pradesh	NA
Do.	Madhya Pradesh State Mining Corp. Ltd. (Pradesh State Government, 100%)	Hirapur and Khatamba Mines, Madhya Pradesh	NA
Do.	Rajasthan State Mines and Minerals Ltd. (Rajasthan State Government, 100%)	Jhamarkotra Mine, Rajasthan	NA
Do.	Hindustan Zinc Ltd. (Indian Government, 100%)	Maton Mine, Rajasthan	NA
Zinc	Binani Zinc Ltd.	Binanipuram Smelter, Kerala	38
Do.	Hindustan Zinc Ltd. (Indian Government, 100%)	Chanderiya Smelter, Rajasthan	70
Do.	do.	Debari Smelter, Rajasthan	59
Do.	do.	Visakhapatnam (Vizag) Smelter, Andhra Pradesh	40

[e] Estimated. NA Not available.
[1] Scheduled for startup in 2005.
[2] Capacity of clusters of surface mines varies extremely, depending on demand. Estimated total capacity is 1.5 million metric tons per year.
[3] Estimated total phosphate rock capacity is 800,000 metric tons per year.

THE MINERAL INDUSTRIES OF INDONESIA AND EAST TIMOR (TIMOR-LESTE)

By Pui-Kwan Tse

INDONESIA

Despite the Severe Acute Respiratory Syndrome (SARS) outbreak in the Asia and the Pacific region and the August terrorist attack in the capital, Indonesia's gross domestic product (GDP) grew by 4.1% in 2003 compared with that of 2002; this rate of growth was higher than the Government's target of 3.9%. Indonesia had not recovered completely from the 1997 financial crisis. With the assistance of the International Monetary Fund and the implementation of new macroeconomic policies, the inflation rate slowed to 5.1% by yearend, interest rates fell, and the rupiah stabilized against the U.S. dollar. Private and Government consumption remained the principal drivers of growth. Private consumption accounted for 2.8% of the GDP growth. Net foreign direct investment continued to decline in 2003. The Capital Investments Coordinating Board approved $13.2 billion of foreign investment projects in 2003, of which only 38% may be carried out. The declining investment, when correlated with the World Economic Forum 2003 report, indicated that Indonesia ranked 72 out of 102 countries in the growth competitiveness index (a measure that is based on an assessment of each country's macroeconomic environment, the condition of its public institutions, and its use of technology). In terms of its business competitiveness, Indonesia ranked 60 among 101 countries considered in the report; this ranking placed it ahead of only three other countries in the Asia and the Pacific region: the Philippines (64), Pakistan (72), and Bangladesh (86). Larger amounts of the foreign investment flowed to countries with a more attractive economic climate, such as China, Thailand, and Vietnam (Bank Indonesia, 2004, p. 7; Capital Investments Coordinating Board, 2004§;[1] Jakarta Post, 2004g§).

Indonesia's principal mineral resources are coal, copper, gold, nickel, oil, and tin. Although labor-intensive agriculture continued to have a dominant role in the country's economy, revenues from the mineral sector provided about 25% of the country's budget. The mining sector engaged about 0.5% of the labor force and contributed about 3% of GDP. In some areas of the country, the contribution of the mining sector to local development was very significant. In Mimika, Papua Province, and North Luwu, South Sulawesi Province, for example, the mining sector accounted for 97% and 80%, respectively, of the local GDP. The mining sector helped in the development of many areas of Indonesia that otherwise would not have been developed.

New tax rules and environmental issues were matters of concern to the mining sector. The cumulative tax increase could be as high as 60%. New levies by regional and local governments could cause production costs to increase by an additional 6%. During the past 5 years, investment in Indonesian mining has decreased by 90% to $200 million in 2003 compared with $2 billion in 1998. The Capital Investments Coordinating Board approved only seven new foreign mining projects and two foreign expansion projects in 2003 for a total value of $14.9 million. Legal and policy uncertainties, lingering labor conflicts, and the chaotic implementation of regional autonomy were mainly responsible for this drop in investment in the mining sector. Security conditions also worried many foreign investors, especially in the Provinces of Aceh and Papua. During the past several years, mineral outputs remained stable despite the unfavorable investment conditions. The continuing lack of investment will have a negative impact on future mineral production and state revenue if the situation does not change (MiningIndo.com, 2003b§).

Government Policies and Programs

Since the financial crisis of 1997, business investments in new plants and equipment have been slower than expected. Weak investment reduced the long-term potential for growth and higher income employment. The political changes that accompanied the movement away from decades of authoritarian rule toward a market-oriented economy and the development of democratic political institutions created uncertainty with respect to decisionmaking, which discouraged new commitments from foreign and domestic investors. Investment was also hindered by the country's weak banking sector and legal framework (PricewaterhouseCoopers, 2003). Since the implementation of law No. 22/1999 (regional autonomy) and law No. 25/1999 (fiscal decentralization) in 2001, there had been misunderstandings about the operation and distribution of gas, mining, and oil revenue such as land rent, royalties, and taxes. Law No. 18/2000 [value-added-tax (VAT)], which took effect on January 1, 2001, classified coal, gold, and silver as nontaxable commodities. Any taxable expenditures that were incurred to produce these commodities were nonrefundable and could increase production costs by 10% for many companies. As a result, many companies may no longer be able to operate economically and could close. The Ministry of Finance planned to propose amendments to the tax law in 2004. The Government also planned to revise laws on fiscal balances, regional autonomy, and regional balance. The revised laws are intended to clarify the role of provinces and, gradually, to achieve fiscal equality between the Central and Provincial Governments (PricewaterhouseCoopers, 2003). In addition, the Capital Investment Coordinating Board urged the Government to provide a tax holiday to attract mining investors. The investment climate in Indonesia was unattractive compared with other countries. The proposed tax holiday would create job opportunities and assist economic recovery (Petrominer, 2004j).

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[1] References that include a section mark (§) are found in the Internet Reference(s) Cited sections.

In 2003, the Government changed the Government/oil company production-sharing split to encourage investors to participate in the oil and gas upstream activities. In 2002, only one company signed an oil and gas production-sharing contract. In 2003, the production-sharing split was changed from 80/20 (or 85/15, depending on the location of the lease block) to 65/35 for oil and from 60/40 (or 70/30, depending on the location of the lease block) to 55/45 for gas; 18 contracts were signed. The Government intended to provide the same incentives to 10 new blocks in 2004. To control the sale of the lease block area, no company was allowed to sell more than a majority (51%) of its shares during its first 3 years under the contract (Petrominer, 2004j).

Law No. 41/1999 banned opencast mining in protected forest areas; according to the law, however, the House of Representatives could grant a special permit to allow mining in protected forest areas. The House of Representatives and the Ministry of Energy and Mineral Resources jointly established a team to evaluate how the forest law affected mining companies. The team recommended that 22 mining companies be allowed to mine in protected forest areas. The recommendation was based on the companies' stage of mining, their disbursed investment value, and the impact of their operations on the environment. The Government issued the Government Ordinance in Lieu of Law (Perpu) No. 1/2004 in November 2003; the President signed the Perpu in 2004 to allow 13 companies to resume their operations in protected forests. (A Perpu is similar to a law, but issuance of a Perpu does not require House approval.) These 13 companies were PT Antam Tbk (Bulit N. Maluku and Bahobulu Southeast Sulawesi), PT Freeport Indonesia Co. (Freeport) (Mimika and Punccak Jayawijaya in Papua), PT Gag Nickel, PT Indominco Mandiri, PT International Nickel Indonesia TBK (PT Inco), PT Interex Sacra Raya, PT Karimun Granite, PT Natarang Mining, PT Nusa Halmahera Minerals, PT Sorik Mas Mining, PT Telsart Tambang Kencana, and PT Weda Bay Nickel. These 13 have proven reserves that were considered to be economic to mine. Although the area that had been explored was large, the total area recommended for exploitation by the 13 companies was only 2.07% of the total protected area. A coalition of 11 nongovernmental organizations urged the Parliament not to adopt Perpu No.1/2004 into law because the measure was contradictory to article 22 of the 1945 Constitution, as amended. The coalition argued that open pit mining in protected forests would hamper the economic growth of 25 regencies/municipalities of the country. The remaining nine companies that were originally recommended to receive special licenses were not given licenses to resume activities in protected forests because no proven reserves had yet been discovered in their areas. Other companies were still being studied as well (Petrominer, 2004g; Jakarta Post, 2004c§).

In 2003, after 4 years of discussion, the draft of a new mining law that would replace law No. 11/1967 (general mining) was completed and submitted to the State Secretariat for approval before submission to the House of Representatives to be legislated into law. Replacement of law No. 11/1967 was considered to be necessary because the old law was not compatible with current conditions in the mining sector, which had changed considerably during the past several years. The Ministry of Energy and Resources withdrew the draft from the State Secretariat at yearend 2003, however, and planned to set up a technical team to redraft the proposed law (Petrominer, 2004e).

Since the regional autonomy law took effect in 2001, foreign investors have complained about the large number of confusing permits and levies. In 2003, the President signed a decree to centralize the approval and issuance of mining permits to foreign and domestic investors and removed the power of regional officials to grant such approvals. The House of Representatives planned to revise the regional autonomy law in 2004 (MiningIndo.com, 2003e§; Jakarta Post, 2004d§).

Loss of revenue caused by illegal mining has been a significant problem for Indonesia. The Government estimated that the Central and regional governments have lost at least $118 million in revenues and taxes per year. Illegal miners focused their activities on coal, gold, and tin because these minerals were relatively easy to process. Owing to an oversupply of tin in the world and the resultant low tin price, the state-owned tin company PT Tambang Timah Tbk (Timah) was in a position of financial loss in the early 2000s. In 2002, the Government banned the export of tin ore and cracked down on the export of tin by illegal miners; as a result, tin prices increased on the world market. Illegal mining also caused environmental damage. The Australian Government urged the Indonesian Government to halt the illegal gold-mining activities on Halmahera Island where the Australian company Newcrest Mining Ltd. mined. In South Kalimantan, coal producers spent millions of dollars to rehabilitate the land destroyed by illegal miners. During the past several years, Indonesia produced a total of about 100 million metric tons per year (Mt/yr) of coal by licensed coal producers; illegal miners extracted an estimated 25 Mt/yr of coal. Most of the illegal miners operated on the coal producers' properties. At the Tanah Bumbu coal mine, which was operated by PT Arutmin Indonesia at Satui, illegal miners produced about 40,000 metric tons (t) per night; Arutmin's production from that area, however, was only 9,000 metric tons per day. Illegal miners also sold their coal at prices that were about 25% lower than those charged by legal companies (Petrominer, 2004c, h; MiningIndo.com, 2003d§).

Trade

Indonesia liberalized its trade regime and took a number of important steps to reduce protectionism. In the early 1990s, the Government initiated a series of annual deregulation measures that were designed to lower tariff rates gradually. As of January 2003, about 70% of Indonesia's tariff rates ranged between 0% and 5%. In the Uruguay Round market access negotiations, Indonesia committed to bind 94.6% of its tariff schedule; most tariffs were bound at 40%. Products for which tariff bindings exceeded 40% or that remained unbound included automobiles, iron and steel, and some chemical products. On January 1, 2002, Indonesia fully implemented the final stage of its commitments under the Association of Southeast Asian Nations (ASEAN) Free Trade Area Agreement. In line with this Agreement, the Government categorized tariffs into international non-ASEAN tariffs and ASEAN tariffs.

Most non-ASEAN products have tariffs of 0%, 5%, or 10%, except for such sensitive items as automotive goods and alcohol. ASEAN tariffs, which are tariffs on products that are of at least 65% ASEAN origin and are therefore subject to the ASEAN Free Trade Agreement, were 0%, 2.5%, and 5%.

In 2003, Indonesia's exports increased by 6.8% to $61.0 billion and imports increased by 3.1% to $32.4 billion. Oil and gas exports accounted for 20.7% ($13.6 billion) of the export total. Indonesia increased its oil and gas imports to $7.5 billion, or 23.3% of the import total. The value of aluminum exports increased by 5.3% to $1.2 billion, but the value of copper exports decreased by 33% to $2.0 billion as a result of the landslide at the Grasberg mine. Coal exports increased to 83 million metric tons (Mt); Asia was the leading market for Indonesian coal. Because the Chinese Government restricted coal exports from its country, coal prices in the Asian market increased to $33 per metric ton from $27 in the fourth quarter of 2003. Machinery and mechanical equipment was the leading nonoil and gas import category and accounted for 12.9% of the total value of imports. The value of iron and steel imports decreased by 8.6% to $2.0 billion because the Government restricted the importation of steel products (Central Bureau of Statistics, 2004).

Commodity Review

Metals

Aluminum.—PT Aneka Tambang Tbk (PT Antam) completed all mandated studies for the Tayan chemical-grade alumina project in Tayan, West Kalimantan Province. Of the $220 million needed to fund the project, PT Antam planned to provide 30% through investment equities; the remaining 70% would be raised through the formation of a joint venture. Initially, Japan's Alumina Chemical Co. expressed interested in joining the project but later withdraw its name from consideration. PT Antam also considered Malaysia Mining Corporation Bhd of Malaysia and Showa Denko Co. of Japan as potential partners. Under this arrangement, PT Antam would have a 40% share of the new joint venture, and the two partners would each have a 30% share. PT Antam also requested that the Government reduce its holdings of PT Antam to 51% from 65%. The bankable feasibility study for the project was completed in December (Petrominer, 2004i).

Copper.—In 2003, Freeport continued to focus on the exploration of block A targets that had a high potential to add to reserves. Additional probable and proven reserves of 5,700 t of contained copper metal, 3,900 t of silver, and 520 t of gold were discovered in block A in 2003. Freeport planned to invest $13 million on drilling below its Mill Level Zone in 2004.

Field exploration activities outside the mining operations area were suspended because of safety and security issues. Another uncertainty was related to the mining rights in restricted forest areas covered by contracts of work. Freeport's partners, PT Nabire Mining and Eastern Minerals, also suspended their exploration activities in block B in 2003, and both applied to resume exploration activities in 2004. On October 9, 2003, a landslide at the southern part of Freeport's Grasberg Mine left eight people dead. Consequnetly, operations at the mine were suspended. On December 12, after another landslide happened at the same location, the company decided to suspend all mining operations until the second quarter of 2004. Mining operations in 2004 will be limited to work in the company's Deep Ore Zone underground mine and extraction of low-grade ore from the open pit. Mining at the high-grade ore zone will be deferred until 2005 to ensure the stability of the pit wall. As a result of the landslides, production from the open pit area declined by more than 17% in 2003 compared with that of 2002. Shipments of copper concentrates to China and Japan were suspended until mid-2004 (Petrominer, 2003, 2004b).

In 2003, Freeport and PT Indocopper Investama (Indocopper) informed the Indonesian Government that they planned to merge. Freeport McMoRan Copper & Gold Inc. of the United States held 81.28% of Freeport shares, and Indocopper, 9.36%. The remaining shares were owned by the Indonesian Government. The merger was intended to reduce administrative and operational costs. Under the Contract of Work, the merger must be approved by the Indonesian Government. Shareholders approved the merger during an extraordinary general meeting. The Government wanted the company to divest its shares to local investors. The Ministry of Finance and the Ministry of Energy and Mineral Resources reviewed the request; the decision was pending and was to be announced in 2004 (MiningIndo.com, 2003a§).

In 2003, owing to lower copper ore grades and recovery rates, the production of copper from Indonesia's second leading copper- and gold-producing mine, Batu Hijau in Sumbawa Island, West Nusa Tenggara Province, decreased by 3.5% to 287,892 t. Because of higher grades, gold output increased slightly. As a result of higher metal prices, an increase in byproduct gold credits, and lower smelting and refining charges, the net income of PT Newmont Nusa Tenggara increased in 2003. Exploration and drilling at satellite copper and gold prospects near Batu Hijau continued in 2003. Nongovernmental organizations from East Lombok urged the Government to investigate whether the submarine sea-tailing disposal from Batu Hijau mine could have caused severe health problems for people who lived in the area. The concentration of heavy metals in the soil and water at nearby areas was higher than the standard levels. The Government decided to send an investigation team to the area in 2004 (MiningIndo.com, 2004b§).

Gold.—Kalimantan Gold Corp. Ltd. of Canada resumed its exploration work on the Mansur copper/gold prospect in August 2002. The Mansur prospect, which is located in central Kalimantan, was discovered in 1984. Geophysical data indicated that the area potentially contained high metal (copper and gold) content at depth. Kalimantan Gold also held a 1,242-square-kilometer (km^2) concession area in central Kalimantan. The Baroi prospect was under the sixth generation Contract of Work. During early reconnaissances in 1985 and 1997, the company discovered high-grade mineralization in the area. When the company restarted exploration at the prospect in November 2002, it identified high-grade copper and gold mineralization over an area that covered 26 km^2. In 2003, exploration work was constrained by a shortage of funds; as a result, the company decided to focus on the Baroi prospect. The

Baroi was divided into four zones; the company concentrated its work in the Far East Zone and conducted 22 drillings. Drilling six holes to 300 meters (m) depth was completed during 2003 (Kalimantan Gold Corp. Ltd., 2004).

PT Nusa Halmahera Minerals (a joint venture of Newcrest Ltd., 82.5%, and PT Antam, 17.5%) completed initial drilling in the Kencana deposit in North Maluku Province. High-grade gold up to 600 grams per metric ton was recovered from the drill core. The epithermal gold mineralization at Kencana is in a shallow to moderately northeast-dipping quartz breccia vein hosted in andesite and volcanoclastics (MiningIndo.com, 2004a§).

Iron and Steel.—Indonesia produced less than 3 Mt/yr of steel and consumed about 4 Mt/yr. In November 2002, the Ministry of Industry and Trade issued a decree to limit the quantity of imported steel products. Steel producers were allowed to import hot- and cold-rolled coils as raw materials or as supplements for production purposes. Imported coils were not allowed to be sold in domestic markets or to be transferred to other companies. The aim was to prevent imported coils, which were cheaper than local coils, from entering the domestic market. The Government also increased the tariff rates for cold- and hot-rolled coils to 25% and 20%, respectively, for 1 year. Steel products were mainly from Japan, the Republic of Korea, and Russia. After months of public debates, the Government announced that the import tariffs on hot- and cold-rolled coils would be eliminated for 1 year starting on April 1, 2004. Local steel producers objected to the policy changes because such changes would hurt their business. The downstream steel producers were in favor of the changes because the shortage of raw material had caused a decline in capacity utilization rates. Some plants operated at about 40% of their output capacities. Higher energy costs also contributed to the decline in production (SEAISI Newsletter, 2003; Jakarta Post, 2004f§).

Indonesia's only integrated steel producer, State-owned PT Krakatau Steel, planned to increase its steel output to 5 Mt/yr by 2008 to meet increasing domestic demand for hot-rolled coil, plate, and wire. Krakatau had the capacity to produce 1.9 Mt/yr of slab and 500,000 metric tons per year of billet from its direct-reduced iron and electric arc furnace processes. The company imported its iron ore pellet mainly from, in order of amount imported, Brazil, Chile, and Bahrain and considered sourcing pellets from Australia in its expansion plan. Krakatau will announce its decision in 2004 after consultation with the Government. Krakatau sold 75% of its steel output to local customers. Owing to increased domestic demand, Krakatau announced that it would export only 10% of its steel output in 2004 (Metal Bulletin, 2004).

Nickel.—Owing to increased demand, the supply of nickel continued to tighten in 2003 as China and the Republic of Korea expanded their stainless steel output capacities; as a result, the price of nickel in the world market rose by 30% at yearend. Despite an increase in production costs, the net income of PT Antam and PT Inco increased sharply in 2003. In 2003, PT Antam's production reached only 89% of its target for contained nickel in ferronickel. PT Inco's nickel-in-nickel-matte production increased by 18% in 2003, and its net profit increased to $104.19 million in 2003 compared with $30.28 million in 2002 (Jakarta Post, 2004a§, e§).

In November, PT Antam's partner BHP Billiton Ltd. announced that it had no plan to mine nickel on Gag Island, which is located on the western tip of the Raja Ampat archipelago and was being considered for nomination as one of four marine World Heritage sites in Indonesia. The company's exploration site was located in a restricted forest area, and the development of a nickel laterite deposit in the area was, therefore, an environmentally sensitive issue. Studies associated with the baseline environmental and social impact assessment were suspended. PT Antam received $60 million in loans from Bank Central Asia to fund the company's ferronickel expansion project. The company also issued a 7-year note worth $200 million for the project. On October 3, the construction of the company's FeNi III smelter at Pomalaa, South Sulawesi, was begun. The FeNi III smelter was to be built by an unincorporated consortium of Japan's Kawasaki Heavy Industries, Ltd. and Mitsui Co. Ltd. On November 14, PT Antam signed a contract with Waertsila Oyj of Finland to build a diesel-generated powerplant to power the smelter. PT Antam continued infill drilling activities of lateritic nickel prospects at the Buli, the Halmahera, the Mandiodo, and the Tapunopaka prospects. The development of these nickel deposits was expected to reduce transportation costs to the Pomalaa processing facility (PT Aneka Tambang Tbk, 2004).

Tin.—Indonesia was the second ranked tin-producing country in the world behind China. The Indonesian tin sector was dominated by two PT Koba Tin [a joint venture of Timah and Malaysia Smelting Corp. (MSC)] and PT Tambang Timah (PT Timah) (a subsidiary of Timah). In 2002, the Government decided to ban the export of tin ore and concentrates; as a result, the supply of tin tightened in Southeast Asia. In 2003, the local government in Bangka issued several tin-operating licenses to locals. Seven small tin smelters were put into operation in Bangka Island. Owing to increased tin prices and tight global supplies, traders exported tin ore and concentrates illegally to Malaysia and Singapore. Because of illegal trading, the supply of tin concentrates was tightened in the domestic market and affected Koba's and PT Timah's operations. In 2003, the output of tin metal from PT Timah decreased by 20% compared with that of 2002. PT Timah exported 95% of its tin output. Each month, from about 150 to 200 t of refined tin with a minimum purity of 99.85% was sold to Singapore dealers from small tin producers in Bangka. These new smelters could not sell their products directly on the international market because they did not have brand names. Singapore-based traders resold the tin to major smelters in Malaysia and Thailand (Yahoo Finance, 2004§).

MSC and PT Mitra Stania Prima signed a joint exploration and mining cooperation agreement in Bangka Island. PT Mitra held exploration and mining permits in an area of 4,039 hectares in Banka Island. MSC set up a wholly owned subsidiary, Penanaman Modal Asing (PMA), to oversee the tin mining activities in Indonesia. In 2002, MSC acquired 75% interest in Koba. Under the terms of the agreement, all exploration and mining works in the area would be carried out by PMA. Under the existing law, the exploration and mining permits were issued to Indonesian individuals and entities. Foreign companies could participate in the exploration and mining by cooperation with the respective permit holders. The exploration and mining permits could continue to be owned by PT Mitra until the eighth-generation Contract of Work is finalized by the Government and the permits are transferred to PMA. MSC allocated $1.76 million for drilling and exploration in 2004 and 2005. PT Mitra could acquire 25% equity in the PMA (MiningIndo.com, 2003c§).

Industrial Minerals

Cement.—The Indonesian cement sector was dominated by the following producers (by order of size): PT Semen Gresik Group, which included PT Semen Padang and PT Semen Tonasa; PT Semen Cibinong; PT Indocement Tunggal Prakarsa; and PT Semen Andalas Indonesia. These producers accounted for 93% of the country's cement production. According to the Indonesia Cement Association, domestic demand for cement was 27.54 Mt in 2003, which was slightly higher than the 27.23 Mt in demand during 2002. As Indonesia's economy slowly recovered and development activities such as housing construction improved, operating on the margin became an important challenge for domestic producers. During the past 4 years, production costs increased more rapidly than selling prices. In 2003, the utilization rate of cement plant capacity was less than 78%. To anticipate future demand for cement, PT Semen Padang planned to construct a 2.3-Mt/yr cement plant in West Sumatra. The company had a current installed capacity of 5.24 Mt/yr. The cost of the new plant was estimated to be $234 million, and the construction would take 3 years to complete. The new plant was to be known as the Indarung VI project (Industry Canada, 2004§; Jakarta Post, 2004b§).

Diamond.—BM Diamondcorp Inc. of Canada completed a feasibility study at the Cempaka diamond project, which is located in the Danau Seran area of Borneo Island in southeastern Kalimantan. PT Galuh Cempaka (Diamondcorp, 80%, and PT Antam, 20%) would be the operator for this project. Diamondcorp bought the asset from Rio Tinto Plc and Malaysian Mining Corp. Under the terms of agreement, Diamondcorp would pay a total of 1.6% of gross earnings to these companies. The feasibility study concluded that the Cempaka project could be economically developed. The area was projected to have a recoverable diamond resource of 633,450 carats, which was sufficient to support 16 years of mining. Diamondcorp also conducted a feasibility study on the Bobaris block property, which was discovered by Dutch geologists during the 1920s in the Sungai Pinang area of the Meratus Range in southeastern Kalimantan. Diamondcorp also completed an environmental impact study, which was submitted to local and regional governments for approval. The working capital that Diamondcorp acquired was insufficient to put the Cempaka project into production, and the company continued to pursue additional funding for the project (BM Diamondcorp Inc., 2003).

Mineral Fuels

Coal.—Indonesia is rich in coal resources. In 2003, coal output increased to 114.0 Mt, which was an increase of more than 10% from that of 2002. Owing to increased demand for coal in Asia, output was expected to increase to 135 Mt in 2004 and to 150 Mt in 2006. As the coal price rose on the international markets, especially in the last quarter of 2003, the Chinese Government restricted coal exports from China. Indonesia's coal producers increased their coal exports by 15% to 85.7 Mt in 2003 and were expected to increase exports to 99 Mt in 2004. Coal exports to Japan and Taiwan accounted for 40% of the 2003 total. During the year, domestic coal consumption increased by 5% to 30.7 Mt. Powerplants consumed about 64% of the total domestic demand, and cement producers, 16%. Domestic coal demand was expected to reach 32.5 Mt in 2005. Because of the desire to take advantage of the price difference between the international and domestic markets, Indonesia's coal producers preferred to export their output instead of selling it to domestic consumers. When state-owned PT Tambang Batubara Bukit Asam (PTBA) experienced transport problems shipping its coal from its South Sumatra mine to West Java's powerplant, East Kalimantan coal companies were reluctant to provide coal for the powerplant because shifting potential exports to domestic use would hurt their profits. As a result of reducing electricity-generating output, the frequency of rotating power outages increased on the Java-Bali grid. The Indonesian Coal Association urged the Government to enact a policy that requires coal producers to meet domestic demand (Petrominer, 2004h; U.S. Embassy Jakarta, Indonesia, 2004a).

Indonesia's second ranked coal producer, PT Kaltim Prima Coal Co. (KPC), which was jointly owned by PT Rio Tinto Indonesia (50%) and BP Amoco (50%), agreed to divest a total of 51% shares of its equity to local buyers. The share offer was to be based on the fair market value. The 100% share price was valued at $822 million. The divestment of 51% of KPC shares was completed in 2003. The regional governments received 31% of the shares, and PTBA, 20%. Of the 31% regional shares, the East Kutai regency's company Perusahaan Daerah Pertambangan Energi Kutai Timur received 18.6%, and the East Kalimantan Provincial Government's Melati Bhakti Satya received 12.4%. The Commigsion VIII of the Parliament urged KPC to sell another 32.4% of its shares to Indonesian companies in 2004. KPC planned to increase coal output to 25 Mt in 2004 and 30 Mt in 2005. Two new coal mines, Melawan and Bengalon, were expected to come into operation in 2004 and 2005, respectively (Petrominer, 2004j).

Owing to a financial contract disagreement, PTBA canceled a cooperation agreement with China National Technology Import Export Corp. to develop an underground coal project in the area of Ombilin, West Sumatra Province. Opencast coal resources in the Ombilin area have been gradually depleted. PTBA planned to increase coal production in the Ombilin area to meet domestic demand. In 2003, PTBA produced 10.0 Mt of coal from its mines in Bukit Kendi, Ombilin, and Tanjung Enim and planned to increase production to 10.3 Mt in 2004. The company also planned to acquire six small coal mines in Kalimantan during 2004; together, the six mines had total coal reserves of 20 Mt. PTBA geologists discovered an additional 84 Mt of coal resources in Bukit Bunian Sukamerindu in the Lahat regency of South Sumartra. The heat value of the coal was

6,800 kilocalories per kilogram; the sulfur content was less than 1%; and the ash content, less than 4% (Petrominer, 2004f).

Natural Gas and Petroleum.—Indonesia's natural gas output increased by 4% to 89.3 billion cubic meters in 2003 and supplied 26% of the world's liquefied natural gas (LNG) from two production centers at Arun in Aceh and Bontang in East Kalimantan. The Government estimated that domestic natural gas consumption would increase by an average of 9% per year. The state-owned utility company Perusahaan Listrik Negara (PLN) planned to reduce costs and harmful emissions by increasing natural gas use from 21% to 40% by 2015. Natural gas consumption by powerplants could increase to 105 million cubic meters per day in 2015 from 23 million cubic meters per day in 2003. Investment in natural gas and oil exploration and development decreased sharply during the past 5 years. In 2003, the Government signed 15 new oil exploration block contracts, which was up from 1 in 2002 and 6 in 2001. The Government planned to offer 10 new oil and gas blocks in 2004. Because the Government had not yet announced the implemention regulations for the 2001 oil and gas law, major international companies were absent from the bidding on these new blocks (U.S. Embassy Jakarta, 2004b; Jakarta Post, 2003a§).

In 2003, Indonesia produced an average of 1.15 million barrels per day (Mbbl/d); this was a decline of 8% from the average of 1.25 Mbbl/d produced in 2002 and was also lower than the Government's 2003 target of 1.27 Mbbl/d. It was the 10th straight year of decline in oil output. In order of production output, China National Offshore Oil Co., Exspan Nusantara, and PT Caltex Pacific Indonesia accounted for 95% of the total decline. Aging oilfields, lower exploration investment, and regulation and policy uncertainties were the main reasons for the decline of oil production. During the past several years, foreign companies have been reluctant to explore for new oilfields. More than 80% of the country's oil reserves was from oil block concessions that were signed in the 1970s. Blocks signed after 1990 accounted for only 5% of oil reserves. Foreign oil companies reduced their drilling expenditures during the past several years. The number of wells drilled decreased to 54 in 2003 from 102 in 2002. Oil production was expected to continue to decline in 2004, and oil analysts predicted that because of declining production and rising consumption, Indonesia would become a net oil importer within the next few years.

The Government gave approval for Pertamina to become a state-owned limited company in 2003. Under the Governmental decree, the company will divest ownership of its noncore assets within the next 2 years. The Government will decide within the next 2 years whether Pertamina must transfer its oil refineries and LNG plants to the Government. As the Indonesian economy continues to improve during the next several years, domestic demand for oil and gas was expected to increase. The Government hoped that Pertamina will discover more oil and gas to prevent the country from becoming a net oil importer by 2010 as many analysts have predicted (Jakarta Post, 2003b§).

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EAST TIMOR (TIMOR-LESTE)

East Timor [Democratic Republic of Timor-Leste (Timor of the rising sun)] is located on the eastern part of the island of Timor. On the west is the Indonesian Province of Nusa Tenggara Timur; Australia is situated 500 kilometers south across the Timor Sea. East Timor became independent on May 20, 2002, after more than 400 years under Portugese rule, 25 years of conflict, a violent transition from Indonesian rule, and 2.5 years of United Nations administration. During the transition, the country's infrastructure was seriously damaged, and people were relocated to other places. With assistances from the Asian Development Bank, the multidonor Trust Fund for East Timor, and the World Bank, the reconstruction of the country's infrastructure had made significant progress. Following a moderate 3% GDP increase in 2002, the economy contracted by about 3% in 2003 after the gradual withdrawal of the United Nations civil administration and peacekeeping operations that began early 2002 led to a decline in economic activity. East Timor has substantial oil and gas potential, and the Government counted on the oil and gas sector to contribute a significant portion of its revenues to the budget. The ratification of the Timor Sea Treaty between Australia and East Timor will be significant for East Timor's future by allowing the exploitation of the Bayu-Undan gasfield and oilfield and the development of the Sunrise gasfield. Analysts estimated that during the next several years, East Timor's petroleum sector could provide revenue that accounts for up to 50% of GDP and 85% to 90% of the Government revenues and foreign exchange (Asian Development Bank, 2004).

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TABLE 1
INDONESIA: PRODUCTION OF MINERAL COMMODITIES [1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003
METALS						
Aluminum:						
Bauxite, wet basis, gross weight	thousand tons	1,116	1,151	1,237	1,283	1,263
Metal, primary[e]		106,000	160,000	180,000	160,000	180,000
Chromite sand, dry basis[e]		6,400	1,000	1,000	1,000	1,000
Copper:						
Mine, Cu content		766,027	1,012,054	1,048,694	1,171,726	1,005,837
Metal						
Smelter, primary		126,700	173,800	217,500	211,200	247,400
Refinery, primary		90,800	158,400	212,500	192,400	223,300
Gold, mine output, Au content[2]	kilograms	127,184	123,994	162,605	142,238	141,019
Iron and steel:						
Iron sand, dry basis		584,428	489,126	469,132 [r]	378,376 [r]	245,409
Metal:						
Ferroalloys:						
Ferronickel		44,068	47,749	47,769	42,306	43,894
Ferromanganese[e]		12,000	12,000	12,000	12,000	12,000
Pig iron, direct reduced iron	thousand tons	1,740	1,820	1,480	1,500	1,230
Steel, crude[e]	do.	2,890	2,850	2,780	2,460 [r]	2,040
Nickel:						
Mine output, Ni content[3]		89,100	98,200	102,000	123,000	143,000
Matte, Ni content		45,400	59,200	63,471	59,500 [r]	70,200
Ferronickel, Ni content		9,225	10,111	10,302	8,807	8,933
Silver, mine output, Ag content	kilograms	288,200	255,578	269,825	293,520	285,206
Tin:						
Mine output, Sn content		51,761	55,624	61,863	88,142	71,694
Metal		49,709	47,129	53,796	67,455	66,284
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	23,925	27,789	31,100	33,000 [e]	35,500 [e]
Clays:						
Bentonite[e]		5,213 [4]	5,000	5,000	5,000	5,000
Fire clay[e]	thousand tons	1,850	1,900	1,900	1,900	1,900
Kaolin powder[e]		21,389 [4]	15,000	15,000	15,000	15,000
Diamond:[e]						
Industrial stones	thousand carats	23	23	23	23	23
Gem	do.	7	7	7	7	7
Total	do.	30	30	30	30	30
Feldspar[e]		23,236 [4]	24,000	24,000	24,000	24,000
Gypsum[e]		5,707 [4]	6,000	6,000	6,000	6,000
Iodine[e]		74 [4]	75	75	75	75
Nitrogen, N content of ammonia	thousand tons	3,457	3,617	3,665	4,200	4,250
Phosphate rock[e]		617 [4]	630	600	600	600
Salt, all types[e]	thousand tons	650	650	680	680	680
Stone:						
Dolomite[e]		2,907 [4]	3,500	3,000	3,100	3,100
Granite	thousand tons	4,107	5,941	3,975	4,966	3,939
Limestone	do.	15,540 [4]	16,000 [5]	16,000 [e, 5]	16,500 [e, 5]	17,000 [5]
Marble[e]	cubic meters	702 [4]	1,000	1,000	1,000	1,000
Quartz sand and silica stone[e]		140,428 [4, 5]	145,000 [5]	145,000 [5]	145,000 [5]	145,000 [5]
Sulfur, elemental[e]		3,450	3,500	3,600	3,600	3,600
Zeolite[e]		569 [4]	400	400	400	400
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite		72,795	25,000	40,807	42,690	50,000
Bituminous	thousand tons	72,618	77,015	92,500	103,329	114,000
Gas, natural:						
Gross	million cubic meters	86,863	82,334	79,470	85,959 [r]	89,324
Marketed[e]	do.	49,500	45,100	44,000	51,000	54,000
Petroleum, crude including condensate	thousand 42-gallon barrels	547,610	516,070	489,460	432,000	413,000

See footnotes at end of table.

TABLE 1--Continued

INDONESIA: PRODUCTION OF MINERAL COMMODITIES [1]

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised.

[1] Table includes data available through August 30, 2004.

[2] Includes Au content of copper ore and output by Government-controlled foreign contractors' operations. Gold output by operators of so-called people's mines and illegal small-scale mines is not available but may be as much as 20 metric tons per year.

[3] Includes a small amount of cobalt that was not recovered separately.

[4] Reported figure.

[5] Cubic meters.

TABLE 2
INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Locations of main facilities	Annual capacity^e
Aluminum:				
Bauxite		PT Aneka Tambang Tbk (Government, 65%)	Kijang, Bintan Island, Riau	1,300
Metal		PT Indonesia Asahan Aluminum (Nippon Asahan Aluminum Co. Ltd. of Japan, 59%, and Government, 41%)	Kual Tanjun, North Sumatra	250
Cement		PT Indocement Tunggal Prakarsa	Cirebon and Citeureup, West Java; Tarjun, South Kalimantan	15,400
Do.		PT Semen Andalas Indonesia	Aceh Besar	1,000
Do.		PT Semen Baturaja (Persero)	Baturaja-Ogan Komering Ulu, South Sumatera	1,250
Do.		PT Semen Bosowa Maros	Kabupaten Maros, Sulawesi Selatan	2,200
Do.		PT Semen Cibinong	Narogong, East Java	11,800
Do.		PT Semen Gresik (Persero)	Gresik and Tubar, East Java	5,000
Do.		PT Semen Padang (Persero)	West Sumatra	5,240
Do.		PT Semen Tonasa (Persero)	Pangkep, Sulawesi Selatan	3,590
Coal		PT Adaro Indonesia (New Hope Corp, 50%; PT Asminco Bara Utama, 40%; Mission Energy, 10%)	Paringin and Tutupan, South Kalimantan	22,000
Do.		PT Arutmin Indonesia (PT Bumi Resources Tbk, 80%, and Bakrie Group, 20%)	Mulia, Senakin, and Satui, South Kalimantan	11,000
Do.		PT Berau Coal (PT United Tractor, 60%; PT Armadian, 30%; Nissho Iwai, 10%)	Berau, East Kalimantan	13,000
Do.		PT Kaltim Prima Coal Co. (PT Rio Tinto Indonesia and British Petroleum Amoco, 49%; Government of East Kutai Regency, 31%; PT Tambang Batubara Bukit Asam, 20%)	Samarinda, East Kalimantan	18,000
Do.		PT Kideco Jaya Agung (Samtan Co. Ltd. of the Republic of Korea, 100%)	Pasir, East Kalimantan	12,000
Do.		PT Tambang Batubara Bukit Asam (state-owned)	Tanjung Enim and Ombilin, South Sumatra	19,000
Copper:				
Concentrate		PT Freeport Indonesia Co. (Freeport-McMoRan Copper & Gold Inc. of the United States, 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Papua	800
Do.		PT Newmont Nusa Tenggara (Newmont Gold Mining Co. of the United States, 45%; Sumitomo Corp., 35%; PT Pukuafu Indah, 20%)	Sumbawa Island, West Nusa Tenggara	300
Metal		PT Smelting Co. (Mitsubishi Materials Corp., 60.5%; PT Freeport Indonesia Co., 25%; others, 14.5%)	Gresik, East Java	210
Gas:				
Natural	millon cubic feet per day	ExxonMobil Oil Indonesia	Arun and Aceh, North Sumatra	1,700
Do.		Roy M. Huffington (subsidiary of HUFFCO Group of the United States)	Badak, East Kalimantan	1,000
Do.		Total Indonesie	Offshore East Kalimantan	2,100
Liquefied		PT Arun LNG Co. Ltd. (Government, 55%; Mobil Oil, 30%; Japan Indonesia LNG Co., 15%)	Balang Lancang amd Aceh, North Sumatra	10,000
Do.		PT Badak LNG Co. Ltd. (Government, 55%; HUFFCO Group, 30%; Japan Indonesia LNG Co., 15%)	Bontang, East Kalimantan	7,900
Gold	metric tons	Aurora Gold Ltd. (100%)	Balikpapan, Central Kalimantan	60
Do.		PT Freeport Indonesia Co. (Freeport-McMoRan Copper & Gold Inc. of the United States, 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Papua	110
Do.		PT Kelian Equatorial Mining (Rio Tinto Ltd, 90% and PT Harita Jaya Raya of Indonesia, 10%)	Sangatta, East Kalimantan	15
Do.		PT Newmont Minahasa Raya (Newmont Mining Corp., 80%, and PT Tanjung Serapung, 20%)	Manado, North Sulawesi	1
Do.		PT Newmont Nusa Tenggara (Newmont Gold Mining Co. of the United States, 45%; Sumitomo Corp., 35%; PT Pukuafu Indah, 20%)	Sumbawa Island, West Nusa Tenggara	16
Do.		PT Prima Lirang Mining (Billiton BV of the Netherlands, 90%, and PT Prima Maluku Indah of Indonesia, 10%)	Lerokis, Wetar Island	3

See footnote at end of table.

TABLE 2--Continued
INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Locations of main facilities	Annual capacity[e]
Nickel:			
In ore	PT Aneka Tambang Tbk (Government, 65%)	Pomalaa, South Sulawesi and on Gebe Island	80
Do.	PT International Nickel Indonesia Tbk (Inco Ltd. of Canada, 59%; Sumitomo Metal Mining Co. Ltd. of Japan, 20%; others, 21%)	Soroako, South Sulawesi	70
In matte	PT Aneka Tambang Tbk (Government, 65%)	Pomalaa, South Sulawesi	24
Do.	PT International Nickel Indonesia (Inco Ltd. of Canada, 59%; Sumitomo Metal Mining Co. Ltd. of Japan, 20%; others, 21%)	Soroako, South Sulawesi	68
Nitrogen	PT Aseah-Aech Fertilizer (Government, 60%, and other members of the Association of Southeast Asian Nations, 40%)	Lhokseumawe, North Sumatra	506
Do.	PT Pupuk Iskandar Muda (Government, 100%)	do.	506
Do.	PT Pupuk Kalimantan Timur (Government, 100%)	Bontang, East Kalimantan	1,010
Do.	PT Pupuk Sriwijawa (Government, 100%)	Palembang, South Sumatra	1,440
Petroluem, crude thousand barrels per day	Atlantic Richfield Indonesia, Inc. (subsidiary of Arco of the United States)	Arjuna and Arimbi, offshore, West Java	170
Do.	Maxus Southeast Asia Ltd. (subsidiary of Maxus Energy of the United States)	Cinta and Rama, offshore, Southeast Sumatra	95
Do.	Pertamina (Government, 100%)	Jatibarang, West Java, and Bunyu, offshore East Kalimantan	80
Do.	PT Caltex Pacific Indonesia (Texaco Inc., 50%, and Chevron Corp., 50%, both of the United States)	Minas, Duri, and Bangko, central Sumatra	700
Do.	Total Indonesie (subsidiary of Compagnie Francaise des Petroles of France)	Handi and Bakapai onshore and offshore East Kalimantan	180
Steel, crude	PT Ispat Indo	Sidoarjo, Surabaya	700
Do.	PT Krakatau Steel (Government, 100%)	Cilegon, West Java	2,400
Do.	PT Komatsu Indonesia Tbk	Jakarta	8
Do.	PT Wahana Garuda Lestari	Pulogadung, Jakarta	410
Tin:			
In ore	PT Koba Tin (Malaysia Smelting Corp., 75%, and PT Tambang Timah Tbk, 25%)	Koba, Bangka Island	25
Do.	PT Tambang Timah Tbk (Government, 65%)	Onshore and offshore islands of Bangka, Belitung, and Singkep	60
Metal	Mentok Tin Smelter (PT Tambang Timah Tbk)	Mentok, Bangka Island, South Sumatra	68
Do.	Koba Tin Smelter (PT Koba Tin)	Koba, Bangka Island, South Sumatra	25

[e] Estimated; estimated data are rounded to no more than three significant digits.

THE MINERAL INDUSTRY OF JAPAN

By John C. Wu

Japan is located in East Asia between the North Pacific Ocean and the Sea of Japan (East Sea), east of the Korean Peninsula. The country's land area is 374,744 square kilometers, and its population was about 127.3 million in 2003. Japan is a high-income developed country. Its economy ranked second in the world with a gross domestic product (GDP) of $4.3 trillion; its per capita GDP was $33,719 in 2003. Its GDP and per capita GDP based on purchasing power parity, however, were estimated to be $3.5 trillion and $27,574, respectively, in 2003 (International Monetary Fund, 2004§;[1] World Bank Group, 2004a, b§).

Japan was one of the most industrialized and technologically advanced countries in the world despite its limited indigenous natural resources. Japan relied heavily on imports of mineral fuels and a wide variety of nonfuel minerals and mineral products to meet the raw material requirements for its large manufacturing and utility (electricity and gas) sectors. Japan, however, has substantial indigenous resources of industrial minerals, such as dolomite, iodine, limestone, pyrophyllite, and silica (table 3).

Japan's production capacities of the chemical, construction material, electricity, and ferrous and nonferrous metals industries in the manufacturing and utility sectors were among the highest in the world. These industries processed imported raw materials and produced a broad category of mineral products, which included chemical compounds, construction materials, ferrous metals, fertilizer materials, industrial minerals, inorganic chemicals, nonferrous metals, petrochemicals, and refined petroleum products, for domestic consumption by the downstream industries in the manufacturing and construction sectors and for export to the world markets. The electricity and gas industries used imported coal, natural gas, petroleum, and uranium and other nuclear fuel materials to produce electricity and processed natural gas to meet the energy requirements for the construction, manufacturing, mining, and other sectors of the economy.

In 2003, Japan was one of the world's top importers and consumers of primary aluminum, cadmium metal, coal, cobalt metal, copper ore and metal, diamond, ferrochromium, ferronickel, fluorspar, gallium metal, gold metal, iron ore, ilmenite and rutile, indium metal, lead ore and metal, lithium metal, manganese ore and metal, magnesium, liquefied natural gas (LNG), nickel ore and metal, crude petroleum, platinum-group metals, phosphate rock, potash, rare earths, industrial salt, silicon metal, silver metal, tin metal, tungsten ore, zinc ore and metal, and zircon. The country was one of the world's major exporters of cement, refined copper, inorganic chemicals, compound fertilizers, iodine, electrolytic manganese dioxide, high-purity rare (minor) metals, iron and steel, and titanium sponge and titanium products.

The mining sector was the smallest sector of Japan's industry-based economy. According to the Government statistics on the GDP at constant prices classified by economic activities of Japan's national accounts, the percentage contribution of the mining sector to Japan's GDP was only 0.2%. The percentage contribution to Japan's GDP by the mineral industry, which included the mining (0.2%) and mineral processing of ferrous and nonferrous metals (1.4%), chemicals (1.9%), fabricated metal products (1.0%), petroleum and coal products (1.1%), and industrial mineral products (0.7%) industries, however, was 6.3% (Economic and Social Research Institute, 2004b§).

The mineral industry was important to the Japanese economy because of its sizable contribution to the GDP and the vital role it played in supplying primary materials not only to its own construction and manufacturing sectors, but also to those sectors of China, the Republic of Korea, and Taiwan in Northeast Asia and to such members of the Association of Southeast Asia Nations (ASEAN) as Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam in Southeast Asia.

The Japanese economy, as measured by real GDP in 1995 constant prices, continued a positive growth of 3.2% in fiscal year 2003 (from April 2003 to March 2004) following a positive growth of 1.1% (revised) in fiscal year 2002 (from April 2002 to March 2003). Japan's real GDP (in 1995 constant prices) rebounded to a positive growth of 2.4% in calendar year 2003 following a negative growth of 0.3% (revised) in calendar year 2002. The higher growth in 2003 was largely owing to the substantial increase in private demand especially in private plant and equipment investment and increase in exports of goods and services. Japan's real GDP was estimated to be $4.7 trillion in 2003 (Economic and Social Research Institute, 2004a§).

In 2003, Japan's industrial production, as measured by the indices of mining and manufacturing, increased by 3.3%. The number of unemployed workers in Japan decreased to 3.50 million from 3.59 million (revised) in 2002, and the total labor force decreased to 66.66 million from 66.69 million in 2002. As a result, the unemployment rate in Japan dropped slightly to 5.3% from a record high of 5.4% in 2002. Japan's merchandise trade surplus rose to $87.9 billion from $78.9 billion in 2002. As a result, the Japanese yen appreciated by 8.2% to ¥115.94 against $1.00 in 2003. As measured by the consumer price index, Japan's rate of deflation decreased to 0.3% from 0.9% in 2002 (Japan Institute for Labor Policy and Training, 2004§).

Government Policies and Programs

Because of its limited indigenous mineral resources, to secure stable and efficient supply of mineral resources by promoting exploration and development of minerals overseas and to encourage domestic metals recycling were Japan's two major mid- to long-term mineral resources policies.

In fiscal year 2003, Government budgets related to the mining industry, which totaled about $750 million, were reduced by 5.9% from those of fiscal year 2002. Major cuts in fiscal year 2003 included those to the ocean resources efficient utilization research program by 41.9% to $20 million, aid for the exploration and development of domestic mine program by 36.8% to $38 million, the rare metal stockpile program by 23.7% to $96 million, and resources exploration technology cooperation under the Official Development Assistance Program (ODA) by 8.3% to $171 million. The budgets for the mineral-resource-related technology development program and operation of the Metal Mining Agency of Japan (MMAJ), however, were raised by 22.6% to $55 million and 17.8% to $118 million, respectively (Agency for Natural Resources and Energy, 2003§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

The MMAJ, in cooperation with the Japan International Cooperation Agency (JICA), continued to undertake overseas mineral exploration projects as part of the ODA in 2003. In response to requests from the governments of developing countries, the MMAJ provided technical assistance, which included the transfer of advanced exploration technology to these governments, and carried out a broad range of basic exploration programs to further exploration and development of their mineral resources. The MMAJ also provided financial aid (in the form of low-interest-bearing loans) and exploration assistance and technical support, which included geologic and geophysical surveys and drilling, to private Japanese companies and their foreign partners that were involved in joint-exploration works outside of Japan in 2003.

To assist and accelerate mineral production through effective mineral exploration with nongovernmental organizations in developing countries, the MMAJ started a new mineral exploration program, which was called the Joint Basic Exploration Scheme (JBES), with a budget of $5 million for fiscal year 2003. The annual budget was expected to increase gradually to $15 million by fiscal year 2005.

The target commodities of the JBES were, in order of priority, copper, zinc, nickel, platinum-group metals, and rare metals, which included cobalt, chromium, manganese, rare earths, tantalum, titanium, and tungsten. The potential joint-venture partners of the JBES included such organizations as state-owned mineral enterprises, regional government organizations, local geological survey agencies, and private companies that held an exploration license and had the power to sign and carry out the JBES. A typical JBES agreement would include minimum work and expenditure commitment and farm-in arrangements with projects that would last 1 to 5 years. After completing the first-round survey program, the MMAJ would have the right to transfer, through a bidding system, its exploration interests to Japanese companies. If a suitable Japanese company could not be found, then the MMAJ could return its interest to the joint-venture partner (Metal Mining Agency of Japan, 2003§).

In 2003, the MMAJ's ongoing ODA projects included seven mineral exploration projects, a deep ocean mineral exploration project, and an environmental survey project. The seven ongoing mineral exploration projects were to explore for copper and gold in porphyry copper and vein-type deposits in the East Java area of Indonesia; gold in greenstone-type deposits in the Baoule-Banifing area of Mali; gold, lead, silver, and zinc in massive sulfide deposits in the Zacualpan area of Mexico; copper, gold, and molybdenum in porphyry copper and vein-type deposits in the Western Erdenet area of Mongolia; copper and zinc in massive sulfide deposits in the Marrakech-Tekna area of Morocco; and copper, lead, and zinc in Kuroko-type deposits in the Yani-Pelecucho area of the La Paz region in Bolivia and in the Hopa area in northeastern Turkey. The ongoing deep ocean mineral exploration project was to explore for cobalt, gold, lead, nickel, silver, zinc, and other minerals in selected areas within the exclusive economic zones in the federated states of Kiribati and Niue. The ongoing environmental survey project was to conduct a geochemical baseline study that involved analyses of river water quality, stream sediments, and other analyses in the Viti Levu South region of Fiji (Metal Mining Agency of Japan, 2004, p. 27-29).

Environmental Issues

Japan's first law to regulate soil contamination in urban areas, the Soil Contamination Countermeasures Law, took effect on February 15, 2003. To solve the problem of soil contamination caused by hazardous substances and to prevent human health from being damaged by the contamination, companies that handle chemicals would be required to comply with the new law. Under the law, when the condition of the soil ceases to be monitored because of a plant closure or when a Prefecture Governor judges that human health may be negatively affected, the landowners are required to investigate the land for soil contamination. If soil contamination exceeds a certain level, then the Prefecture Governor must designate the contaminated land as a polluted site and disclose the information to the public by recording the change in the land registry. If human health is at risk, then the Prefecture Governor is to order the polluter or the landowner to clean up or cover the contaminated soil site. To ensure credibility in the examination of soil contamination, the Environment Minister designates technically capable investigators as certified bodies (Japan for Sustainability, 2003§).

After the Japanese Government enacted the Designated Household Appliance Law (the Home Appliance Recycling Law) in April 2001, illegal dumping at the sides of roads, in rivers, on mountainsides, and in the ocean increased. People reportedly had been arrested by police for trying to dump such discarded appliances as air conditioners, refrigerators, televisions, and washing machines near train stations. About 18 million to 20 million appliances were junked every year in Japan; only about 9 million units, however, had been collected and sent to 37 recycling centers in 2003. To handle its own products as demanded by the Government under the Home Appliance Recycling Law, Matsushita Electric Industrial Co. Ltd., which was one of Japan's leading producers of consumer electronics and electric products, established the Matsushita Eco-Technology Center (Metech) in 2001 and built a $43 million advanced recycling plant with four disassembly lines in Yashiro, Hyogo Prefecture, in western Japan. Metech's plant reportedly handled more than 500,000 units of discarded household appliances in its first year of operations and gradually increased to 1 million units and achieved a 10% to 15% increase above the 50% to 60% recycling rate required by law in 2003 (Lai, 2003§; Lytle, 2003§).

Production

Mine production of all nonferrous metals (except zinc) and most industrial minerals (except dolomite and kaolin) declined in 2003 because of depleting ore reserves. Mine production of zinc increased because of higher ore production from the Toyoha Mine in Hokkaido Prefecture. Limestone production declined because of lower consumption as aggregate for cement and for concrete. Japan's coal output was estimated to have remained at about the same level as that of 2002. In 2003, 11 small-scale open pit coal mines and 1 underground coal mine still operated in the Prefectures of Hokkaido and Yamaguchi. The output of crude petroleum and natural gas increased in 2003 but remained very small.

In the mineral processing industry, production of most nonferrous metals, such as refined copper, gold, lead, nickel, tin, titanium, and zinc, increased owing to the stronger demand for metals in the domestic and overseas markets in 2003. Production of ferrochromium decreased sharply in 2003 because of a plant closure by Shunan Denko in Yamaguchi Prefecture and a plant idled by NKK Materials Co. Ltd. in Toyama Prefecture. Production of iron and steel increased to the highest level in 14 years owing mainly to the stronger domestic demand by the automobile, machinery and equipment, and shipbuilding industries and the continued high level of exports. Production of titanium sponge metal increased owing to strong domestic demand despite a decrease in exports of titanium sponge. Production of cement and other construction-related materials was lower because of the downturn in the construction sector in 2003. Production of refined petroleum products was mostly higher in 2003 because of increased domestic demand for petroleum products that accompanied the recovery of the economy in early 2003 (table 1).

Trade

Japan was a net importer of minerals because of its large imports of mineral fuels. Japan's mineral trade deficit increased to $78.8 billion in 2003 from $63.8 billion in 2002 as a result of higher import bills for almost all mineral fuels and nonfuel minerals and despite higher export earnings from most of minerals and mineral products in 2003 (table 4).

Total imports of minerals increased by 20.9% to $117.3 billion and accounted for 30.7% of the total imports, which were valued at $382.8 billion in 2003. Of the total minerals imports, $81.0 billion was for such mineral fuels as coal, LNG, crude and partially refined petroleum, refined petroleum products, and other mineral fuels; $7.5 billion, for ores and concentrates of ferrous and nonferrous minerals, slag, scrap, and ash of iron and steel, other metals, and metal compounds; and $1.2 billion, for such industrial minerals as cement, earths and stone, lime, plastering materials, salt, and sulfur. Imports of processed minerals, mineral-related chemicals, and metals totaled $27.6 billion, of which $4.0 billion was for mineral-related chemicals and fertilizers; $14.6 billion, for products of iron and steel and nonferrous, rare, and other base metals; $5.7 billion, for precious and semiprecious stones and precious metals; and $3.3 billion, for articles and products of asbestos, cement, ceramics, glass, mica, and stone (Ministry of Finance, 2003b, p. 9-13, 15-16, 34-41).

Total exports of minerals, mineral-related chemicals, and processed minerals products increased by 15.9% to $38.5 billion and accounted for 8.2% of Japan's total exports, which were valued at $470.7 billion in 2003. Exports of iron and steel products and nonferrous, rare, and other base metals totaled $27.3 billion. Exports of processed mineral articles and products of asbestos, cement, ceramics, glass, mica, and stone amounted to $4.7 billion. Exports of cement, earths and stone, lime, mineral fuels, nonferrous minerals, plastering materials, salt, and sulfur were $2.0 billion. Exports of mineral-related chemicals and fertilizer were $2.4 billion. Exports of precious and semiprecious stones and precious metals were $2.1 billion (Ministry of Finance, 2003a, p. 9-13, 15-16, 34-41). Physical measures of the exports and imports of mineral commodities in 2001 and 2002 are listed in tables 10 and 11.

Structure of the Mineral Industry

Japan's mineral industry consisted of a small mining sector of coal and nonferrous metals, a large mining sector of industrial minerals, and a large mineral-processing sector of ferrous and nonferrous metals and industrial minerals (table 2). Mining and mineral-processing businesses were owned and operated by private companies incorporated in Japan.

In the mining sector, the number of major nonferrous metal mines remained at two in 2003. The major industrial mineral mines totaled about 40 in 2003. The coal mining sector consisted of 11 small-scale open pit mines mostly in Hokkaido Prefecture and one underground mine at Kushiro in Hokkaido Prefecture, which was owned and operated by Kushiro Coal Mining Co. Ltd.

Japan's mining capacity of nonferrous metals (mainly gold, lead, silver, and zinc) and coal had decreased substantially in the past 2 years. The number of persons employed by the mining sector totaled about 50,000 in 2003, unchanged from that of 2002 (Statistical Handbook of Japan, 2004§).

In the mineral-processing sector, the iron and steel industry continued to cut the number of employees to 155,325 from 165,932 in 2002. The industry's production capacity of pig iron decreased to 84.4 million metric tons per year (Mt/yr) from 93.2 Mt/yr in 2002, and production capacity of crude steel decreased to 120.5 Mt/yr from 144.8 Mt/yr in 2002. In the nonferrous metal industry, which included smelting and refining of copper, gold, lead, silver, zinc, and other minor metals, the number of its regular employees was reduced to 5,572 from 5,664 in 2002. In 2003, Japan's production capacity of refined copper remained at 1.5 Mt/yr; refined gold increased to 182.4 metric tons per year (t/yr) from 164.4 t/yr in 2002; refined lead remained at 275,000 t/yr; refined silver increased to 2,980 t/yr from 2,920 t/yr in 2002; and zinc remained at 750,000 t/yr. Japan's electrolytic manganese dioxide production capacity decreased by 19,000 t/yr to 58,000 t/yr largely as a result of the closure of the Takaoka plant by Japan Metal & Chemical Co. Ltd. in Toyama Prefecture. Japan's cement industry cut the number of its regular employees by 176 to 3,660 and reduced its cement clinker capacity to 81.4 Mt/yr from 82.9 Mt/yr (Ministry of Economy, Trade and Industry, 2003a, p. 130, 135; 2003c, p. 94-95, 148, 150; Arumu Publishing Co. Ltd., 2004, p. 50).

Commodity Review

Metals

Aluminum.—Production of primary aluminum (unwrought aluminum) by NLM at the Kambara smelter in Shizuoka Prefecture was insignificant. Virtually all Japan's requirements for primary aluminum were met by imports. In 2003, imports of primary aluminum increased by 14% to 2.94 Mt valued at $4.37 billion, of which 2.04 Mt was ingot and 899,215 t was alloys (Ministry of Finance, 2003b, p. 665).

Of the total primary aluminum imports, about 46% was supplied from Japan's 11 overseas aluminum smelter projects; Japanese aluminum and major trading companies held substantial equity shares in those smelters in Australia, Brazil, Canada, Indonesia, Mozambique, New Zealand, the United States, and Venezuela (table 5). In 2003, Japan diversified its import sources of primary aluminum and aluminum alloy into 55 countries worldwide. Among the 55 countries, the major suppliers were Russia (24.5%), Australia (20.1%), Brazil (9.3%), China (9.1%), New Zealand (7.3%), South Africa (6.9%), Indonesia (5.2%), Canada (4.7%), the United Arab Emirates (3.1%), and Venezuela (2.9%). The United States supplied only 8,550 t and accounted for 0.3% of imported primary aluminum and aluminum alloys (Ministry of Finance, 2003b, p. 665).

Japan resumed imports of primary aluminum from Venezuela in early 2003 after a disagreement over new price terms was resolved between Industria Venezolana de Aluminio C.A. (Venalum) and the Japanese consortium of Kobe Steel, Marubeni Corp., Mitsubishi Materials Corp., Mitsubishi Aluminium Co., Ltd., Showa Denko, and Sumitomo Chemical in November 2002. In 2003, Japan imported about 86,000 t of primary aluminum from Venezuela, or 20% of Venalum's output (Mining Journal, 2003b).

Exports of primary aluminum, which included aluminum alloys (13,200 t) and aluminum ingots (4,960 t), totaled 18,200 t and were valued at $42.7 million. The major buyers of aluminum ingot in 2003 were Thailand (57.4%), China (16.8%), the Philippines (5.7%), India (5.5%), and Indonesia (5.5%). The major buyers of aluminum alloys were the Republic of Korea (45.5%), Indonesia (16.2%), Thailand (9.6%), and China (7.8%) (Ministry of Finance, 2003a, p. 576).

Bauxite and Alumina.—Japan was 100% reliant on imports of bauxite for the production of alumina and aluminum hydroxide. In 2003, imports of bauxite increased by 7.5% to 2.01 million metric tons (Mt) valued at $52.5 million. The major suppliers of bauxite in 2003 were Australia (56%), Indonesia (34%), and India (7%). Production of alumina and aluminum hydroxide was by Nippon Light Metal Co. Ltd. (NLM) had the capacity to produce 365,000 t/yr of aluminum hydroxide and 163,000 t/yr of alumina at its Shimizu plant in Shizuoka Prefecture, Showa Denko K.K. had the capacity to produce 220,000 t/yr of aluminum hydroxide and 105,000 t/yr of alumina at its Yokohama plant in Kanagawa Prefecture, and Sumitomo Chemical Co. Ltd. had the capacity to produce 200,000 t/yr of aluminum hydroxide and 105,000 t/yr of alumina at its Ehime plant in Ehime Prefecture (Japan Aluminum Association, 2003, p. 11).

Demand for domestically produced aluminum hydroxide was estimated to be about 380,000 metric tons (t) in 2003. Consumption by end user was, in decreasing order, mainly for the manufacturing of floculant, for rubber and plastic, and for synthetic zeolite. Consumption of alumina was, in decreasing order, mainly for the manufacturing of abrasives, ceramics, refractories, and welding rods. In 2003, Japan exported 136,000 t of aluminum hydroxide mainly to the Republic of Korea, Taiwan, and Thailand and exported 155,000 t of alumina mainly to China, the Republic of Korea, and Taiwan (Japan Aluminum Association, 2003, p. 20; Ministry of Finance, 2003a, p. 112).

In 2003, four major Japanese trading companies invested a total of about $83 million in overseas alumina refining projects in Australia and Brazil. Nissho Iwai Corp. and Itochu Corp. invested about $52 million to raise their equity shares in Worsley Alumina Pty. by acquiring shares from Kobe Steel Co. Ltd. and to increase their stake in bauxite mining and alumina refining operations in Australia. After completion of the acquisition, Nissho Iwai and Itochu would hold 9% and 5% stakes, respectively, in Worsley Alumina. Mitsui & Co. Ltd. and Mitsubishi Corp. invested $21 million and slightly less than $10 million for a 1.47% and 0.64% stake, respectively, in Alumina do Norte do Brasil SA (Alunorte). Mitsui and Mitsubishi had for the first time the right to market about 100,000 t/yr of Alunorte's alumina (Japan Metal Review, 2003b; Nikkei Weekly, 2003a).

Cadmium.—In 2003, Japan was the leading producer and consumer of cadmium in the world. Cadmium was produced mainly as a byproduct of zinc refining operations that mostly used ore imported mainly from Australia, Canada, Peru, and the United States. According to the Japan Mining Industry Association, cadmium was produced by Toho Zinc Co. Ltd. (813 t), Dowa Mining Co. Ltd. (640 t), Sumitomo Metal Mining Co. Ltd. (407 t), Nippon Mining and Metals Co. Ltd. (NMM) (323 t), and Mitsui Mining and Smelting Co. Ltd. (314 t) in 2003 (Arumu Publishing Co. Ltd., 2004, p. 110).

Because of the continued increase in the consumption of electrodes for nickel-cadmium (Ni-Cd) batteries, imports of cadmium ingot and powder jumped by 35.5% to 3,820 t valued at $5.6 million. The major suppliers were the Republic of Korea (32.2%), Russia (20.5%), Canada (13.6%), Germany (8.2%), and Peru (8.0%) (Ministry of Finance, 2003b, p. 673).

In 2003, demand for domestically produced cadmium decreased by 8.1% to 2,380 t, of which 2,210 t was consumed for production of Ni-Cd batteries; 27 t, for production of alloys; 3 t, for plating; 2 t, for production of pigments; and 135 t for other end users (Bulletin of Japan Mining Industry Association, 2004, p. 114).

Chromium.—Japan relied on imports to meet all chromium ore and concentrate requirements for its iron and steel industry. Because production capacity of ferrochromium was reduced, Japan's imports of chromium ore and concentrate dropped sharply by 48% to 185,000 t valued at $14.7 million in 2003.

The major suppliers were India (47.1%), South Africa (40.1%), and Iran (5.4%) (Ministry of Finance, 2003b, p. 169).

Consumption of chromium ore and concentrate by the iron and steel industry decreased by 44% to 166,000 t, of which only 38,500 t was consumed by the ferroalloy industry and 128,000 t, by others. The iron and steel industry's yearend inventory of chromium ore decreased by 69% to 45,000 t, which was the equivalent to about 3 months of consumption in 2003 (Ministry of Economy, Trade and Industry, 2003c, p. 90).

Domestically produced ferrochromium decreased by 78.9% to 19,400 t in 2003. This sharp decline was a direct result of a plant closure by Shunan Denko K.K. in Yamaguchi Prefecture and a plant idling by NKK Materials in Toyama Prefecture in 2003. Imports of ferrochromium increased by 16.6% to 914,000 t valued at $435.2 million owing to increased demand by stainless steel producers. The major overseas suppliers of ferrochromium were South Africa (59.8%), Kazakhstan (20.4%), Zimbabwe (8.2%), China (5.2%), and India (3.5%) (Ministry of Finance, 2003b, p. 627).

Consumption of ferrochromium, which included high-carbon ferrochromium (851,000 t) and low-carbon ferrochromium (42,300 t), increased by 6.2% to 894,000 t, of which 888,000 t was consumed by stainless steel manufacturers and 5,640 t, by ferroalloy producers (Ministry of Economy, Trade and Industry, 2003c, p. 204). Exports of ferrochromium totaled 2,240 t valued at $4.9 million, of which 2,160 t was low-carbon ferrochromium and 83 t, high-carbon ferrochromium. The major buyers of ferrochromium were the United States (82.4%) and Thailand (15.5%) (Ministry of Finance, 2003a, p. 498).

Production of chromium metal was by NKK Materials, which operated a 1,000-t/yr plant that used the silicothermic method at Shinminato in Toyama Prefecture, and by Nippon Denko Co. Ltd., which operated an 800-t/yr plant that used the aluminothermic reduction method at Oshima, a few kilometers south of Shinminato in Toyama Prefecture. In Japan, chromium metal was consumed mainly for the manufacture of supperalloys, heat resisting steel, and electronic materials. In 2003, Japan imported 2,930 t of chromium ingot and powder to meet its demand for chromium metal. The major suppliers were China (1,500 t), the United States (681 t), France (370 t), and the United Kingdom (305 t) (Arumu Publishing Co. Ltd., 2004, p. 100).

Cobalt.—Japan relied 100% on imported cobalt matte and other intermediate products of cobalt for metal production. Sumitomo Metal Mining, which was Japan's sole producer of cobalt metal and cobalt salts (cobalt sulfate and cobalt oxide), operated a cobalt refinery in Niihama, Ehime Prefecture, with a capacity of 600 t/yr (Arumu Publishing Co. Ltd., 2004, p. 74). Japan also imported cobalt hydroxide, metal, oxide, and powder to meet its cobalt requirements.

In 2003, imports of cobalt matte, other intermediate products of cobalt, cobalt ingot, and other articles of cobalt totaled 12,700 t valued at $249.1 million. The major suppliers were Australia (23.0%), Finland (21.3%), Canada (15.8%), Zambia (11.9%), Norway (8.3%), the Democratic Republic of the Congo and the Republic of the Congo (4.4% combined), Belgium (3.8%), and Morocco (2.7%). Japan also imported 2,900 t of cobalt oxide and 603 t of cobalt hydroxide. Belgium and Finland were the two principal suppliers of cobalt oxides and accounted for 65.1% and 26.3%, respectively, and cobalt hydroxide and accounted for 55.2% and 26.9%, respectively. Imports of cobalt oxide and hydroxide amounted to $65.4 million (Ministry of Finance, 2003b, p. 181, 673).

In 2003, domestic demand for cobalt metal increased by 72.1% to 3,540 t, of which 1,040 t was for specialty steel; 404 t, for pipe, plate, rod, and wire; 307 t, for ultrahard tool steel (cemented carbides); 173 t, for manufacturing of magnetic materials; 257 t, for catalysts; and 1,360 t, for other end uses (Ministry of Economy, Trade and Industry, 2003c, p. 272). According to an estimate by Mitsui & Co., the overall demand for cobalt, which included ingot, oxide, powder, and salt, was estimated to be 10,000 t in 2003 compared with 8,200 t in 2001 and 9,500 t in 2002 (Arumu Publishing Co. Ltd., 2004, p. 74).

Copper, Lead, and Zinc.—Toyoha Mining Co. Ltd., which operated the Toyoha Mine in Hokkaido Prefecture, was Japan's sole lead and zinc mining company. In 2003, the mine produced about 389,000 t of crude ore and the mill produced about 5,700 t of lead and about 44,600 t of zinc in concentrates. The mill also produced about 70 t of byproduct silver and a very small amount of byproduct copper in lead and zinc concentrates. Japan relied on imported ores and concentrates for 87.4% of its copper smelters' raw materials requirements, 44.5% of its lead smelters' raw material requirements, and 74.2% of its zinc smelters' requirements for the production of refined copper, refined lead, and refined zinc.

In 2003, Japan was the world's leading importer of copper concentrate and one of the world's major importers of lead and zinc concentrates. Imports of copper concentrate decreased to 4.1 Mt from 4.2 Mt in 2002. The import bill of copper ore and concentrates increased to $2.4 billion from $2.07 billion in 2002. The major suppliers of copper concentrate were Chile (44.7%), Indonesia (16.6%), Australia (10.1%), Canada (9.6%), Papua New Guinea (8.2%), and Peru (4.6%). Imports of lead concentrates increased to 184,500 t valued at $71.8 million from 155,000 t valued at $57 million in 2002. The major suppliers of lead concentrate were the United States (47.3%), Australia (26.1%), and Peru (14.6%). Imports of zinc ore and concentrates were about the same as 2002 (1 Mt), but the import bill for zinc ore and concentrates increased to $238.2 million from $198 million in 2002. The major suppliers of zinc concentrate were Australia (41.7%), Peru (18.7%), the United States (12.7%), Canada (10.4%), Bolivia (5.4%), and Mexico (4.4%) (Ministry of Finance, 2003b, p. 169).

Nittetsu Mining Co. Ltd. completed development of the Atacama Mine (formerly known as El Bronce Project) in Chile. In a joint venture with Inversiones Errazuriz Ltds. of Chile, Nittetsu Mining completed the development of the mine in December 2002, began test operation in January 2003, and started full operation in June 2003. The mine was operated and managed by Minera Atacama Kozan, which was the joint venture between Nittetsu Mining (60%) and Inversiones Errazuriz (40%) that had been established in May 1999. Shipments of copper ore and concentrate to Japan were expected to start in late 2003 or early 2004 (Nittetsu Mining Co. Ltd., 2003§). The mine was expected to produce 74,000 t of copper concentrate in 2003 and 92,000 t in 2004. Nittetsu intended to take between 35,000 and 46,000 t for shipment to Japan and to market the remainder in Chile or ship to the Port Kembla refinery in Australia (Metal Bulletin, 2003).

Sumitomo Metal Mining reportedly held talks with South American-based copper producers to acquire two copper mines in South America and was prepared to invest up to $260 million in the two unnamed mines (Mining Journal, 2003a).

In July, two unnamed Japanese copper producers reportedly reached an agreement with Companhia Vale Do Rio Doce S.A. (CVRD) of Brazil to import 50,000 t/yr of copper concentrates from the Sossego Mine for 5 years beginning in 2005; the mine is located in the northern State of Para in Brazil. Ore reserves at the Sossego Mine were estimated to be 196 Mt at a grade of 1.02% copper plus 0.3 gram per metric ton (g/t) of gold. CVRD began developing the mine in 2003 and was scheduled to start operation with production of 140,000 t/yr of copper concentrate in the second quarter of 2004 (Japan Metal Review, 2003a).

Also in July, Mitsubishi Materials announced that it was to withdraw from its one-third general partnership interest in Chino Mines Co. in the United States, which it held through Heisei Minerals Corp. (Mitsubishi Materials' subsidiary in the United States). Declining revenues and increased losses from the Chino Mine were cited as the main reasons for the withdrawal. Phelps Dodge Corp., which held the remaining two-thirds general partnership interest in Chino Mines, reportedly completed acquisition of the Heisei interest from Mitsubishi Material in December 2003 (Japan Metal Review, 2003c).

Metal production of copper decreased in 2003 because of the weaker domestic demand for wire and decreased exports. Metal production of lead and zinc increased owing to slightly higher domestic demand for lead and zinc in 2003. Japan's capacity utilization rate of the nonferrous metals smelting and refining industry was 97.9% for copper, 82.4% for lead, and 86.8% for zinc, (Ministry of Economy, Trade and Industry, 2003c, p. 97-99, 148).

In fiscal year 2003, Sumitomo Metal Mining completed a capacity expansion of its Toyo copper smelter and refining complex in Besshi, Ehime Prefecture, at an estimated cost of about $121 million. The expansion project involved adjustments and modifications to the converter, flash furnace, flotation plant, tank house (refinery), and other facilities to raise refining capacity to 300,000 t/yr from 270,000 t/yr (Sumitomo Metal Mining Co. Ltd., 2003§).

For the purpose of conducting a feasibility study for a semicommercial-scale plant that will use the Intec copper process, which is a patented hydrometallurgical process for the extraction of copper and precious metals from sulfide ore and concentrates, NMM completed construction of the Intec copper pilot plant at its Hitachi research and development facilities in Ibaraki Prefecture in October 2002. The 100 kilograms per day of capacity pilot plant was commissioned in January 2003. The results of ongoing test work would be employed as input into the feasibility study for the semicommercial-scale Intec copper plant. NMM's Intec copper pilot plant program was cofunded by the Japanese Government agency, New Energy and Industrial Technology Development Organization, and Mitsui Mining and Smelting (Wood, 2003§).

Imports of refined copper decreased by 31.1% to 78,800 t valued at $137.4 million in 2003. The major suppliers of refined copper were Chile (67.4%), Zambia (22.7%), Peru (5.6%), and Indonesia (1.3%). Imports of refined lead decreased by 13.0% to 9,300 t valued at about $8.3 million. The principal suppliers of refined lead were China (92.6%) and Peru (4.5%). Imports of zinc slab (refined zinc, not alloyed) increased sharply by 92.0% to 41,100 t valued at about $35.5 million. The major suppliers of zinc slab were China (54.9%), Peru (31.8%), and Canada (8.7%) (Ministry of Finance, 2003b, p. 659, 669-670).

Domestic demand for refined copper held steady at about 1.16 Mt in 2003. Domestic demand for refined copper, by sector, was 714,000 t for wire and cable, 418,000 t for brass mill products, and 26,900 t for others (Ministry of Economy, Trade and Industry, 2003c, p. 258). Exports of refined copper decreased by 23.3% to 290,000 t valued at $514.6 million in 2003. The major buyers of refined copper were Taiwan (44.5%), China (21.5%), Indonesia (13.3%), the Republic of Korea (10.6%), Thailand (7.0%), and the United States (1.8%). Exports of unrefined copper and copper anodes decreased by 79.5% to 10,300 t in 2003 valued at $24.8 million. Most unrefined copper and copper anodes was exported to the Republic of Korea (46.2%), Taiwan (29.6%), and Hong Kong (11.7%) (Ministry of Finance, 2003a, p. 567).

In 2003, domestic demand for refined lead increased by 0.3% to 208,000 t, of which 166,000 t was for storage batteries; 20,600 t, for inorganic chemicals; 6,520 t, for solder; 2,930 t, for lead pipe and sheet; and 11,600 t, for other uses (Ministry of Economy, Trade and Industry, 2003c, p. 260). Exports of refined lead decreased by 21.8% to 8,080 t valued at $4.2 million. The major buyers of refined lead were Thailand (31.8%), Malaysia (31.3%), and Indonesia (27.9%) (Ministry of Finance, 2003a, p. 581).

Domestic demand for zinc slab increased slightly to 485,000 t, of which 247,000 t was for sheet galvanizing; 83,300 t, for other plating; 64,600 t, for brass mill products; 46,200 t, for die-cast alloy; 23,900 t, for inorganic chemicals; and 19,700 t, for other uses (Ministry of Economy, Trade and Industry, 2003c, p. 264). Exports of zinc slab decreased by 32.7% to 63,900 t valued at $53.2 million. The major buyers were Taiwan (35.4%), Indonesia (19.9%), Vietnam (19.2%), the Philippines (13.0%), Malaysia (5.0%), and Bangladesh (2.3%) (Ministry of Finance, 2003a, p. 582).

Gold and Silver.--Mine production of gold was mainly by Sumitomo Metal Mining from the Hishikari Mine in Kagoshima Prefecture on Kyushu Island. The company, which was working on its Honko (main mine) and Yamada deposits in the Hishikari mining area, produced about 184,000 t of ore and averaged 42 g/t gold or about 7.7 t of gold in 2003 (Bulletin of Japan Mining Industry Association, 2004, p. 137). Other small-scale gold and silver mines were the Arkesi and the Kasuga in Kagoshima Prefecture. Toyoha Mining produced most of Japan's mined silver as a byproduct of lead and zinc mining operations from the Toyoha Mine in Hokkaido Prefecture. Overall mine production of gold and silver was 8,140 kilograms (kg) and 78,900 kg, respectively (Ministry of Economy, Trade and Industry, 2003d, p. 132).

Overseas, Sumitomo Metal Mining (51%) and its partners Teck Cominco Ltd. (40%) of Canada and Sumitomo Corp. (9%) were still waiting for permits for the development of the Pogo underground gold mine near Delta, which is located east of Fairbanks in Alaska. In March, U.S. Federal and State agencies reportedly had released the long-awaited draft environmental impact statement (EIS) for the Pogo gold project. The U.S. Environmental Protection Agency (EPA) was lead agency on the Federal EIS process, with the participation of the Alaska State Department of Natural Resources because the Pogo gold deposit is on State-owned land. The final EIS and record of decision by the EPA were to be issued following a 60-day public comment period and public hearings in Delta and Fairbanks. All permits for the project were to be issued by the end of 2003, and construction of the Pogo gold project could be started in 2004 (Bradner, 2003§). By August 2003, according to a report by the Japan Economic Journal, Sumitomo Metal Mining and Teck Cominco were said to have been given the green light to develop the $330 million Pogo gold project. The mine was expected to start production in 2005 at a rate of 12.5 t/yr of gold (Mining News.net, 2003§).

In 2003, production of refined gold and silver increased by 11.5% and 8.6%, respectively, owing mainly to higher prices of gold and silver in the domestic market. Imports of gold (ingot and powder) decreased by 46.4% to 43,100 kg. Imports of silver (ingot and powder) increased by 43.3% to 1,270 t. The major suppliers of gold ingot and powder were Switzerland (39.8%), Australia (20.9%), Uzbekistan (16.2%), Canada (6.8%), Hong Kong and Kyrgyzstan (3.5% each), and the United States (2.9%). The major suppliers of silver ingot and powder were Peru (28.4%), Mexico (23.5%), Australia (16.7%), the Republic of Korea (15.3%), the United States (7.1%), and China (4.3%). Imports for gold ingot and powder were valued at $491.6 million, and those for silver ingot and powder, $201 million (Ministry of Finance, 2003b, p. 621).

Domestic demand for gold, which included dental and medical, electrical and electronic, industrial arts and crafts, jewelry, and private investment, decreased to 288,000 kg from 303,000 kg in 2002. Domestic demand for gold by end user was for dental and medical, 22,400 kg; electrical, electronic, and communication apparatus, 85,100 kg; private hoarding, 79,500 kg; gold plating, 23,500 kg; jewelry, 20,500 kg; industrial arts and crafts, 4,880 kg; pottery and porcelain, 1,530 kg; decorations and badges, 1,500 kg; and other uses, which included fountain pens and watches, 49,100 kg (table 6). Among the end users, demand for jewelry reached a new low at 20,500 kg in 2003 (Arumu Publishing Co. Ltd., 2004, p. 115).

Domestic demand for silver increased slightly to 2,690 t from 2,670 t in 2002. Domestic demand for silver by end user was for silver nitrate for photography, 1,370 t; silver nitrate for other uses, 295 t; rolled products, 228 t; electrical contacts, 219 t; brazing alloy (silver solder), 95 t; and other uses, 474 t (table 6). The substantial decline in silver nitrate demand for photography was offset by increased demand for silver nitrate for other uses and for electrical contacts (Ministry of Economy, Trade and Industry, 2003c, p. 278).

Exports of refined gold ingot and powder increased by 317.3% to 22,300 kg valued at $252.8 million in 2003. The major buyers of refined gold ingot and powder were the United Kingdom (43.8%), Hong Kong (22.5%), Switzerland (15.2%), South Africa (5.0%), the Republic of Korea (4.9%), Malaysia (2.8%), and Singapore (2.4%). Exports of silver ingot and powder increased by 22.5% to 440.5 t valued at $28.2 million. The major buyers of refined silver and powder were Singapore (20.8%), Taiwan (20.3%), the Republic of Korea (18.5%), China (16.6%), Hong Kong (13.2%), the United States (3.5%), the United Kingdom (3.1%), and Malaysia (2.0%) (Ministry of Finance, 2003a, p. 493-494).

Iron and Steel.—Japan relied 100% on imports to meet the iron ore requirements of its iron and steel industry. In 2003, imports of iron ore totaled 132.1 Mt valued at $3.3 billion. The average cost, insurance, and freight (c.i.f.) import price of iron ore was $25.02 per metric ton compared with $23.54 in 2002. The major suppliers of iron ore were Australia (60.8%), Brazil (18.1%), India (10.7%), South Africa (3.9%), and the Philippines (3.3%). Imports of pig iron totaled 559,000 t valued at $104.9 million. The average c.i.f. import price of pig iron was $187.54 per ton compared with $136.72 in 2002. The major suppliers of pig iron were China (61.7%), Russia (10.7%), India (9.8%), Brazil (5.7%), North Korea (5.1%), the Republic of Korea (3.6%), and South Africa (3.4%) (Ministry of Finance, 2003b, p. 169, 626).

In 2003, consumption of iron ore by the iron and steel industry increased by 0.9% to 114.9 Mt, of which 104 Mt was for ironmaking by blast furnaces; 824,000 t, for steelmaking; and 90,700 t, for other uses. Consumption of other iron ore raw materials by the iron and steel industry included 3.1 Mt of pellets, 673,000 t of iron sand, 204,000 t of ferruginous manganese ore, and 11.8 Mt of other iron ore materials. The industry also consumed 45.1 Mt of iron and steel scrap. Consumption of other major raw materials included 12.4 Mt of limestone, 4.8 Mt of quicklime, 1.5 Mt of dolomite, 1.4 Mt of serpeninite, 462,000 t of silica stone, and 163,000 t of fluorite (Ministry of Economy, Trade and Industry, 2003c, p. 84-86, 90-92).

In 2003, pig iron production increased by 1.4% to 82.1 Mt, of which 81.5 Mt was for steelmaking and 605,000 t, for foundry. The total ironmaking capacity decreased to 84.4 Mt/yr from 93.2 Mt/yr in 2002, and the number of blast (30) and other (1) furnaces for ironmaking decreased to 31 from 39 in 2002 (Ministry of Economy, Trade and Industry, 2003c, p. 28, 94).

Crude steel production increased by 2.6% to 110.5 Mt in 2003, of which 73.6% was processed by basic oxygen furnaces, and 26.4%, by electric furnaces. In the steelmaking sector, the number of basic oxygen furnaces decreased to 62 from 63 in 2002, and the number of electric arc furnaces decreased to 354 from 366 in 2002. The overall crude steel production capacity decreased to 120.5 Mt/yr from 144.8 Mt/yr in 2002 (Ministry of Economy, Trade and Industry, 2003c, p. 39, 94).

In 2003, Japan was the world's second ranked producer of crude steel and accounted for 11.5% of the world total (International Iron and Steel Institute, 2004§). Among Japan's top four steelmakers in 2003, Nippon Steel Corp., which produced 31.3 Mt of crude steel, was thr ranked steel-producing company in the world after Arcelor S.A. of Luxembourg and the LNM Group of the Netherlands Antilles; JFE Steel Corp., which comprised the former NKK Corp. and Kawasaki Steel Corp. and produced 30.2 Mt, ranked 4th; Sumitomo Metal Industries, Ltd., which produced 12.8 Mt, ranked 14th; and Kobe Steel Ltd., which produced 7.3 Mt, ranked 25th.

In 2003, all four integrated steelmakers expected to exceed their targeted sales and to see their combined pretax profit by climbing 150% to $1.5 billion in the first half of the fiscal year ending September 30, 2003, owing to higher prices of steel products; stronger sales to the domestic automobiles, machinery and equipment, and shipbuilding industries; and strong exports to Asia, especially to China (Nikkei Weekly, 2003c).

After merging in September 2002, Kawasaki Steel and NKK continued to operate as fully owned subsidiaries of JFE Holdings Inc. during the transition period between September 27, 2002, and March 31, 2003. Beginning in April 2003, however, the two steel companies were reorganized into the following new operating companies: JFE Steel Corporation, JFE Engineering Corporation, JFE Urban Development Corporation, Kawasaki Microelectronics, Inc., and JFE R&D Corporation. Under JFE Steel, Kawasaki Steel's production plants in Okayama, Chiba, and Hyogo Prefectures merged with NKK's production plants in Hiroshima and Kanagawa Prefectures. The merger of the plants resulted in the establishment of JFE Steel's three steel works. East Japan Works comprised production plants in Chiba, Chiba Prefecture, Nishinomiya, Hyogo Prefecture, and Keihin (Kawasaki), Kanagawa Prefecture. West Japan Works comprised production plants in Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture. Chita Work comprised only one plant in Handa, Aichi Prefecture (JFE Holdings Inc., 2004§; JFE Steel Corporation, 2004§).

To develop high-grade steel sheet for the next generation of automobiles, the major Japanese steelmakers set up an alliance with their European counterparts in 2003. Nippon Steel Corp. and Arcelor were to develop jointly surface-processed steel sheet used in frames and bodies. The two companies would produce highly resilient steel products that help make lighter vehicles. After the steel is galvanized, it is reheated at high temperatures to produce a galvannealed steel sheet that would be more resistant to corrosion and easier to paint. JFE Holdings began joint development with Germany's Thyssen-Krupp Steel AG to produce two types of high-tensile surface-process steel products. Sumitomo Metal Industries and Corus Group Plc of the United Kingdom were to commercialize a new steel sheet product and had exchanged technologies for surface-processing and strengthening. Kobe Steel Ltd. and Voestalpine Stahl GmbH of Austria were to develop jointly high-tensile steel sheet, which has two to three times more strength than conventional steel sheet (Nikkei Weekly, 2003b).

In 2003, domestic demand for steel increased by only 1.8% to about 64.5 Mt, of which 53.4 Mt was ordinary steel products, and 11.1 Mt, specialty steel products. The increase in overall domestic demand for steel was owing mainly to the stronger demand by the manufacturers of automobiles, electric machinery and equipment, industrial machinery and equipment, and shipbuilding and marine equipment. Domestic demand, as measured by orders for ordinary and specialty steels, increased in most end-use categories except construction (table 7).

In 2003, exports of iron and steel decreased by 5.3% to 34.4 Mt because of reduced exports to Africa, North America, and South America. Exports to Asia decreased slightly but remained strong, especially to Thailand, to which exports rose by 7.3% (table 8). Of the total exports of iron and steel, 73.0% was ordinary steel products; 15.4%, specialty steel products; 8.8%, steel ingots and semifinished products; 1.5%, secondary products; and 0.3%, pig iron (Japan Iron and Steel Federation, 2004§).

In 2003, exports of iron and steel products to Asian markets decreased by 4.1%. Exports to the Middle Eastern and European markets, however, increased by 9.1% and 4.1%, respectively, and to Oceania markets by 5.1%; exports to North American and South American markets decreased by 24.4%, and to African markets by 15.7%. Iron and steel exports to the United States dropped by 27.5% to 1.1 Mt (table 8).

Imports of iron and steel products increased by 13.2% to 6 Mt in 2003; this was a rebound following 2 consecutive years of decline. Of the total imports, 2.8 Mt was ordinary steel products; 2.5 Mt pig iron, ferroalloys, steel ingot, and semimanufactured steel; 431,000 t, wire and wire products; and 125,000 t, specialty steel products (Japan Iron and Steel Federation, 2003, p. 18-19). Among the major suppliers of all steel products, the Republic of Korea and Taiwan accounted for more than 90% of total steel products imported by Japan (Japan Iron and Steel Federation, 2004§).

Manganese.—Japan relied entirely on imports to meet its manganese raw material requirements for the iron and steel and electrolytic manganese dioxide (EMD) industries. In 2003, Japan imported 1.03 Mt of high-grade manganese ore, 81,000 t of ferruginous manganiferous ore, 78,200 t of low-grade manganese ore, and 1,980 t of high-grade manganese dioxide ore. The major suppliers of high-grade manganese dioxide ore were Gabon (56.6%), Colombia (32.3%), and China (11.1%). The major suppliers of high-grade manganese ore were South Africa (66.1%) and Australia (30.7%). The major suppliers of low-grade manganese ore were Ghana (76.3%) and South Africa (19.4%). The major suppliers of ferruginous manganiferous ore were India (60.6%) and South Africa (35.9%). The import bill for manganese ores totaled $121.5 million (Ministry of Finance, 2003b, p. 169).

Consumption of manganese ore for the production of ferroalloys increased by 2.0% to 659,000 t, steelmaking decreased by 13.6% to 144,000 t, and other uses increased by 117.9% to 170 t in 2003. Production of ferromanganese increased by 4.2% to 372,000 t (Ministry of Economy, Trade and Industry, 2003c, p. 29). Imports of ferromanganese increased by 50.4% to 87,300 t. The major suppliers were Australia (36.0%), China (34.6%), South Africa (25.8%), and the Republic of Korea (3.1%) (Ministry of Finance, 2003b, p. 626-627).

Consumption of domestically produced high- and low-carbon ferromanganese for steelmaking decreased by 3.6% to 394,000 t, of which 332,000 t was high-carbon ferromanganese and 62,400 t, low-carbon ferromanganese (Ministry of Economy, Trade and Industry, 2003c, p. 204). Exports of ferromanganese increased by 17.4% to 17,400 t. The major buyers were Taiwan (34.8%), the United States (23.8%), Malaysia (13.9%), Saudi Arabia (10.3%), the Republic of Korea (7.0%), and Thailand (6.5%). Export earnings from ferromanganese were valued at $13.8 million (Ministry of Finance, 2003a, p. 497).

In 2003, Japan was the world's leading producer of EMD. Its EMD producers were Mitsui Mining and Smelting, which operated the 24,000-t/yr Takehara plant in Hiroshima Prefecture, and Tosoh Corp., which operated the 34,000-t/yr Hyuga plant in Miyazaki Prefecture and the 18,000-t/yr Thessaloniki (Salonita) plant in Greece. In 2003, Mitsui Mining and Smelting permanently closed its 19,000-t/yr County Cork plant in Ireland owing to a slowdown in demand, a weaker U.S. dollar, increased competition from the Far East, and the growth of private-label brands and rechargeable batteries. The company had operated its Cork plant for the past 27 years. The 100-acre plant site was sold to South Coast Transport Limited in December for more than €15 million, or more than $18.4 million (RTE News, 2003§; Sunday Business Post Online, 2003§).

Of the 49,000 t of EMD produced in 2003, about 26,000 t was consumed domestically for the production of batteries, and 22,500 t was exported. The major buyers were Indonesia (35.3%), Singapore (18.0%), China (15.1%), the Republic of Korea (10.3%), the United States (9.6%), and Thailand (2.7%). Export earnings from manganese dioxides were valued at $28.1 million in 2003 (Ministry of Finance, 2003a, p. 112; Arumu Publishing Co. Ltd., 2004, p. 50). Japan imported 3,220 t of manganese dioxide valued at $3.7 million, of which China provided more than 77%; other major suppliers were South Africa (9.0%) and Belgium (6.1%) (Ministry of Finance, 2003b, p. 181).

Nickel.—Japan relied 100% on imported raw materials to meet its nickel requirements in 2003. Japan was the world's leading importer and consumer of nickel and the second ranked producer of nickel metal after Russia (International Nickel Study Group, 2004, p. 8, 10). All nickel ores and nickel mattes were imported for the production of ferronickel, nickel chemicals (salts), nickel oxide sinter, and refined nickel. Additionally, ferronickel, nickel powder and flake, nickel oxide sinter, nickel waste and scrap, and refined nickel also were imported to meet the nickel requirements of the battery, magnetic materials, nonferrous alloys, and specialty steel industries as well as other end users.

Imports of nickel ore decreased by 4.5% to 4.2 Mt valued at $171.3 million. The suppliers of nickel ore were Indonesia (56.1%), the Philippines (23.9%), and New Caledonia (20.0%). Imported nickel ore from Indonesia contained 38,000 t of nickel; from the Philippines, 16,900 t of nickel; and from New Caledonia, 15,200 t of nickel. Imports of nickel mattes, in gross weight, increased by 18.2% to 120,000 t valued at $671.0 million in 2003. The suppliers of nickel matte were Indonesia (73.8%) and Australia (26.2%). Imported nickel mattes from Indonesia contained 66,400 t of nickel and from Australia, 23,600 t (Bulletin of Japan Mining Industry Association, 2004, p. 108).

Imports of ferronickel, in gross weight, increased by 13.8% to 57,000 t valued at $153.3 million. The suppliers of ferronickel were New Caledonia (65.9%), Colombia (15.9%), the Dominican Republic (11.1%), and Indonesia (7.0%). Imports of refined nickel increased by 32.6% to 53,600 t valued at $477.4 million. The top suppliers of refined nickel were Russia (17.0%), Australia (16.6%), Zimbabwe (15.1%), South Africa (12.9%), Norway (9.0%), China (8.7%), Canada (6.6%), Brazil (6.5%), and the United Kingdom (5.1%).

Imports of nickel oxide sinter, in gross weight, increased by 7.6% to 1,230 t valued at $9.3 million; Australia was the dominant supplier of nickel oxide sinter and accounted for 97.4%. Imports of nickel powders and flakes decreased by 20.9% to 7,730 t valued at $80.1 million. The major suppliers of nickel powders and flakes were the United Kingdom (42.8%) and Canada (42.3%). Imports of nickel waste and scrap decreased by 24.0% to 10,700 t valued at $73.9 million. The major suppliers of nickel waste and scrap were the Netherlands (33.9%), the United States (23.5%), the Republic of Korea (9.5%), Taiwan (7.7%), and Russia (6.6%) (Ministry of Finance, 2003b, p. 169, 627, 664).

In 2003, consumption of nickel ore by the ferroalloy industry increased by 3% to 3.5 Mt. Production of ferronickel was by Hyuga Smelting Co. Ltd. (a wholly owned subsidiary of Sumitomo Metal Mining) in Hyuga, Miyazaki Prefecture, Nippon Yakin Kogyo Co. Ltd. at Oheyama, Miyazu, Kyoto Prefecture, and Pacific Metals Co. Ltd. in Hachinohe, Aomori Prefecture. Production of ferronickel decreased by 0.5% to 369,000 t, which contained about 74,800 t of nickel. Consumption of ferronickel for steelmaking, in gross weight, decreased by 0.1% to 308,000 t (Ministry of Economy, Trade and Industry, 2003c, p. 33, 91, 210). Exports of ferronickel decreased by 15.0% to 102,000 t valued at $166.1 million, of which 51.7% went to the Republic of Korea, and 48.3%, to Taiwan (Ministry of Finance, 2003a, p. 498).

Refined nickel was produced solely by Sumitomo Metal Mining at its nickel refinery that used its matte chlorine leaching electrowinning process in Niihama, Ehime Prefecture. The 36,000-t/yr nickel refinery used imported nickel matte from Australia and Indonesia to produce refined nickel and nickel salts for domestic consumption and exports. Tokyo Nickel Co. Ltd. operated a 60,000-t/yr smelter in Matsuzaka, Mie Prefecture, which also used imported nickel matte to produce briquettes, granules, and nickel oxide sinters for domestic consumption and exports.

To secure new nickel raw material resources for its Niihama complex for nickel and cobalt refining, Sumitomo Metal Mining was constructing a processing plant at Rio Tuba in the southern part of Palawan Island in the Philippines (Coral Bay Project) to produce nickel-cobalt- mixed sulfide from laterite low-grade nickel oxide ore. The total investment in the project was estimated to be $180 million, which would be equivalent to Sumitomo Metal Mining's 54% interest in the project. The processing plant was scheduled to be completed in August 2004, and commercial production was scheduled to begin in December 2004. Sumitomo Metal Mining was negotiating with Inco Limited. for participating in the large-scale hydrometallurgical nickel refining process (Goro Bay Project) in New Caledonia. A decision had not been made by yearend 2003 (Sumitomo Metal Mining Co. Ltd., 2003§, 2004§).

In 2003, domestic demand for refined nickel increased by 6.9% to 69,500 t owing to the continued strong demand by the manufacturers of specialty steel. The consumption of refined nickel by manufacturers of specialty steel increased by 9.7% to 58,400 t, and galvanized sheet by 23.6% to 3,090 t, while that for batteries decreased by 20.1% to 3,180 t; magnetic materials, by 7.4% to 1,840 t; catalysts, by 7.0% to 409 t; and other end uses, by 10.5% to 2,560 t (Ministry of Economy, Trade and Industry, 2003c, p. 270).

Exports of refined nickel decreased by 37.7% to 104 t valued at $1.2 million in 2003. The major buyers were Thailand

(29.5%), Indonesia (27.9%), the Philippines (20.0%), China and Hong Kong (8.7% each), and Vietnam (3.1%). Exports of nickel oxide sinter and other intermediate products of nickel metallurgy increased by 20.8% to 27,900 t valued at $210.9 million. The principal buyers were Taiwan (48.0%), the Republic of Korea (44.2%), and the United Kingdom (7.0%). Exports of nickel powders and flakes increased by 15.0% to 1,670 t valued at $33.0 million in 2003. The major buyers were China (69.0%), Hong Kong (13.3%), and France (6.6%). Exports of nickel waste and scrap increased by 110.2% to 648 t valued at $2.0 million in 2003. The major buyers were the United States (46.4%), China (19.9%), and the United Kingdom (8.4%) (Ministry of Finance, 2003a, p. 574-575).

Titanium.—Japan was the world's second ranked producer of titanium sponge metal and accounted for 28.2% of the world total (Arumu Publishing Co. Ltd., 2004, p. 52). It also was one of the world's major producers of titanium dioxide pigment. All the raw material requirements for production of titanium sponge metal and titanium dioxide pigment, however, were supplied by imports. Titanium ore (rutile) was consumed by the producers of titanium sponge metal. Ilmenite and titanium slag were consumed mainly by the manufacturers of synthetic rutile and titanium dioxide pigment. Small amounts of rutile and ilmenite were consumed as blast furnace additives in the steel industry.

Imports of titanium ore (rutile) decreased by 6.7% to 88,100 t valued at $41.3 million because of lower ore requirements for titanium sponge production in 2003. The major suppliers were Australia (57.8%), India (28.1%), South Africa (8.8%), and Canada (5.2%). Imports of ilmenite increased by 26.9% to 369,000 t valued at $32.8 million. The major suppliers were Vietnam (41.0%), Australia (18.9%), Canada (15.5%), Egypt (13.7%), India (6.1%), and Malaysia (3.4%) (Ministry of Finance, 2003b, p. 170). In 2003, Japan also imported about 102,000 t of titanium slag principally from Canada and South Africa for titanium oxide pigment production (Arumu Publishing Co. Ltd., 2004, p. 97).

According to the Japan Titanium Society (2004, p. 1), production of titanium sponge decreased by 24.9% to 18,900 t in 2003 because of weaker domestic demand and the continued decline in exports to the European Union and other countries except the United States, exports to which grew by 14.9% to 4,540 t in 2003. Total titanium sponge shipments decreased by 17.8% to 18,600 t in 2003. Shipments of titanium sponge to domestic market decreased by 23.2% to 12,900 t. Exports of titanium sponge decreased by 2.4% to 5,710 t. Imports of titanium sponge decreased by 37.9% to 5,720 t. Total shipments of titanium mill products decreased by 4.4% to 13,800 t; domestic shipments of titanium mill products decreased by 6.2% to 6,810 t. Exports of titanium mill products increased by 2.8% to 7,030 t (Arumu Publishing Co. Ltd., 2004, p. 53).

In 2003, Kobe Steel increased its equity in Sumitomo Titanium Corp. to 24.8% from 8.8% in 2002. Under an agreement reached between Kobe Steel and Sumitomo Metal Industries, Kobe Steel would acquire 1.42 million shares of Sumitomo Titanium from Sumitomo Metal Industries. Sumitomo Titanium was the main supplier of titanium sponge to Kobe Steel, which, in turn, was Japan's leading and only integrated producer of titanium mill products. In November 2002, Kobe Steel and Sumitomo Metal Industries had reached a cooperative agreement for Kobe Steel to supply Sumitomo Metal Industries with hot-rolled titanium coil and to cooperate in achieving mutual efficiency and cost reduction with respect to raw materials procurement, production, and distribution in the titanium business (Japan's Corporate News Network, 2003§).

In the domestic market, shipments of titanium mill products to chemical plant and heat-exchange equipment manufacturers decreased to 2,010 t from 2,200 t in 2002. Shipments to power-generation and water-desalination plant manufacturers decreased to 601 t from 886 t in 2002. Shipments to the distributors increased to 1,260 t from 1,140 t in 2002. Shipments to consumer and sports leisure goods manufacturers decreased to 1,080 t from 1,370 t (revised) in 2002. Shipments to aircraft manufacturers increased to 491 t from 447 t. Shipments to automobile manufacturers increased to 767 t from 571 t in 2002. Shipments to architectural and civil engineering materials manufacturers increased to 166 t from 43 t in 2002. Shipments to the manufacturers of energy, marine, and ship materials decreased to 149 t from 194 t in 2002 (Arumu Publishing Co. Ltd., 2004, p. 57; Japan Titanium Society, 2004, p. 1).

According to Government trade statistics, exports of titanium sponge decreased slightly by 0.5% to 6,000 t valued at $40.5 million in 2003. The two principal buyers were the United States (76.1%) and the United Kingdom (16.8%) (Ministry of Finance, 2003a, p. 586). To meet domestic requirements, Japan imported 5,720 t of lower grade titanium sponge and powder valued at $41.8 million. The principal suppliers were Russia (45.4%), Kazakhstan (27.3%), and the United States (19.5%) (Ministry of Finance, 2003b, p. 673).

Imports of titanium mill products decreased to 976 t from 1,390 t in 2002 valued at $43.0 million. The principal suppliers in 2003 were the United States (49.2%), Russia (38.8%), China (3.6%), and Taiwan (2.0%) (Ministry of Finance, 2003b, p. 673). Exports of titanium mill products increased to 8,800 t valued at 217.4 million from 8,700 t in 2002. The major buyers were Sweden (13.2%), China (14.9%), the Republic of Korea (12.1%), Italy (11.2%), France (8.0%), Germany (7.6%), Taiwan (6.7%), the United States (6.3%), and Hong Kong (5.1%) (Ministry of Finance, 2003a, p. 586-587).

In 2003, production of titanium dioxide increased by 5.4% because of the increased demand in the domestic market and an increase in exports. Shipments of titanium dioxide totaled 256,000 t. The end users, in decreasing order, were paints and coating materials, printing inks and pigments, papers, synthetic resin (plastics), chemical fibers, rubbers, condensers, and others (Ministry of Economy, Trade and Industry, 2003b, p. 60).

Imports of titanium oxide increased by 27.0% to 11,600 t valued at $15.2 million from 9,110 t in 2002. The major suppliers were China (59.0%), the Republic of Korea (22.4%), and France (14.1%) (Ministry of Finance, 2003b, p. 181-182). Exports of titanium oxides increased by 12.3% to 28,600 t valued at $80.7 million. The major buyers were China (45.0%), Taiwan (17.2%), the Republic of Korea (9.7%), the United States (4.5%), Indonesia (3.3%), Thailand (2.4%), and the Netherlands (2.2%) (Ministry of Finance, 2003a, p. 113).

Industrial Minerals

Cement.—Japan was one of the world's leading cement producers in 2003. The country's cement production decreased by 4.3% to 68.8 Mt because of decreased domestic construction activities resulting from reduced public works project budgets that generated about 60% of domestic cement demand. As of April, Japan's cement industry comprised 20 companies, which operated 35 plants with 62 kilns with a total capacity of 78 Mt/yr. Japan's cement plants were concentrated in the area that surrounds Osaka in the Kansai (Kinki) region (western Japan), the the area that surrounds Tokyo in the Kanto region (eastern Japan), and the area that surrounds Fukuoka on Kyushu Island where most of Japan's limestone reserves are located (Japan Cement Association, 2003§).

As a result of the continued restructuring in the cement industry, Japan's cement clinker capacity in 2003 decreased to 81.36 Mt/yr from 82.9 Mt/yr in 2002, and the number of regular employees in the cement industry decreased to 3,660 from 3,836 in 2002. Production of cement clinker decreased to 66.8 Mt from 68.9 Mt in 2002, and production of cement decreased to 68.8 Mt from 71.8 Mt in 2002. Of the total cement produced in 2003, 52 Mt was portland cement, 48.3 Mt of which was ordinary portland cement, and 3.7 Mt, high early strength and moderate-heat portland cement; 16.0 Mt, blast-furnace slag cement; 582,000 t, other cement; 93,000 t, fly ash cement; and 73,000 t, white cement. The major raw materials consumed by the cement industry included 76.6 Mt of limestone, 9.8 Mt of clay, 6.1 Mt of silica stone, 5.4 Mt of blast furnace ore slag, and 2.5 Mt of gypsum (Ministry of Economy, Trade and Industry, 2003a, p. 66-70, 127-128, 132, 135).

In 2003, total cement shipments decreased by 4.2% to 68 Mt owing to the decrease in the country's construction activities. Exports of cement clinker increased by 18.0% to 4.91 Mt valued at $88.1 million and exports of portland cement increased by 21.4% to 4.82 Mt valued at $97.2 million. The major buyers of cement clinker were China (30.3%), Hong Kong (26.1%), Australia (15.4%), Malaysia (9.0%), and Benin (7.4%). The major buyers of portland cement were Singapore (32.7%), Hong Kong (18.6%), the Republic of Korea (16.4%), China (12.4%), Nigeria (9.7%), and Taiwan (7.9%). The average export free-on-board (f.o.b.) price of portland cement increased to $20.17 per ton from $19.63 per ton in 2002 (Ministry of Finance, 2003a, p. 100). Imports of portland cement totaled 884,000 t. The Republic of Korea was the dominant supplier and accounted for 98.0%. The average import c.i.f. price of portland cement decreased to $36.15 per ton from $42.82 per ton in 2002 (Ministry of Finance, 2003b, p. 167-168).

To meet the growing demand in Hebei Province, China, *Taiheiyo Cement Corp.* planned to produce ready-mixed concrete at a new plant in Hebei Province. Taiheiyo Cement and two local companies had established a manufacturing subsidiary to run the joint-venture plant. Operations were scheduled to begin in November 2003. The new plant was to procure raw materials from the nearby cement plant operated by Taiheiyo Cement (China) Investment Co. Ltd. (International Cement Review, 2003).

Limestone.—Japan was one of the world's top limestone producers in 2003. Production decreased by 3.9% to a new low since 1986 as a result of decreased consumption as a raw material for cement production and as a construction aggregate for public works projects by the construction industry.

Total sales (demand) of domestically produced limestone decreased to 155.5 Mt from 160.1 Mt (revised) in 2002. Demand for domestically produced limestone by end use was for cement (42.4%), concrete (22.2%), ferrous and nonferrous metals smelting (14.3%), roads (5.8%), soda and glass in casting and making refractories (0.6%), and other uses (14.7%) (Ministry of Economy, Trade and Industry, 2003d, p. 136-137).

In 2003, Japan's imports of limestone, limestone flux, and other calcareous stone totaled 397,000 t valued at $11.2 Mt. The major suppliers were the Philippines (37.7%), Malaysia (32.9%), Vietnam (22.9%), and China (6.1%). Exports of limestone flux, limestone, and other calcareous stone totaled 2.5 Mt valued at $17.7 million. The major buyers were Taiwan (62.9%), Australia (23.2%), and the Republic of Korea (13.8%) (Ministry of Finance, 2003a, p. 100; 2003b, p. 167).

Mineral Fuels

Coal.—In 2003, Japan relied 100% on imports to meet its annual requirements for coking coal and anthracite and about 99% to meet those for steam (thermal) coal. Japan's coal imports accounted for 22% of total world coal imports in 2003. Japan's major consumers of anthracite and coking coal were the coke, iron and steel, nonferrous metals, cement, and paper industries; and of steam coal, the power generating industries (U.S. Energy Information Administration, 2004§).

Coal was produced mainly by an underground mine operated by Kushiro Coal Mine Co. Ltd. and 11 small-scale open pit mines (10 in Hokkaido Prefecture and 1 in Yamaguchi Prefecture). Kushiro was a center for transferring Japanese coal technology to large-scale coal-producing countries in Asia. Japan produced about 1.37 Mt of coal, of which 763,000 t was produced by Kushiro and 605,000 t, from the 11 small-scale open pit mines (Tomita, Shinji, Director, Planning Department, Japan Coal Energy Center, written commun., October 16, 2003).

In 2003, Japan's overall coal imports increased by 5.3% to 167.0 Mt valued at $6.42 billion, of which 107.7 Mt was bituminous coal (steam other than coking coal); 54.4 Mt, coking coal; and 4.9 Mt, anthracite. The major suppliers of coking coal were Australia (64.9%), Canada (15.0%), China (14.2%), and Russia (5.0%); the major suppliers of bituminous coal were Australia (55.1%), Indonesia (19.9%), China (18.9%), and Russia (6.2%); and the major suppliers of anthracite were China (53.3%), Vietnam (33.5%), North Korea (6.7%), and Australia (4.91%). China gained a larger market share in Japan's anthracite coal market by offering lower prices for its anthracite coal (Ministry of Finance, 2003b, p. 171).

Natural Gas and Petroleum.—Japan was one of the world's top importers of natural gas and crude petroleum. Domestic production of natural gas and crude petroleum was insignificant because of the country's limited indigenous oil and gas reserves. Japan's natural gas and crude petroleum reserves were estimated to be 39.6 billion cubic meters and 58.5 million barrels (Mbbl), respectively (Oil & Gas Journal, 2003). In 2003, domestic production of natural gas and crude petroleum totaled 2.84 billion cubic meters and 5.16 Mbbl, respectively, which was equivalent to 3.4% and 0.34% of the 83 billion cubic meters and 1.5 billion barrels (Gbbl) of domestic consumption of natural gas and crude petroleum, respectively (Ministry of Economy, Trade and Industry, 2003d, p. 24-25, 80, 122).

In 2003, Japan relied on imports to meet 96.6% of its domestic natural gas requirements and 99.66% of its crude petroleum requirements. Japan imported 80.2 billion cubic meters of natural gas in the form of LNG and 1.6 Gbbl of crude petroleum (Ministry of Economy, Trade and Industry, 2003d, p. 32-34, 122).

According to the Ministry of Finance (2003b, p. 177) trade statistics, however, imports of LNG totaled 59.1 Mt (88.5 billion cubic meters) valued at $14.6 billion in 2003. The major suppliers of LNG were Indonesia (30.1%), Malaysia (21.0%), Australia (12.9%), Qatar (11.4%), Brunei (11.1%), and the United Arab Emirates (8.6%). Crude petroleum imports were mainly from the Middle East (87.1%) and Asia (7.6), which included China and Southeast Asia. The major suppliers of crude petroleum were the United Arab Emirates (23.4%), Saudi Arabia (22.8%), Iran (15.9%), Qatar (9.4%), Kuwait (6.9%), Oman (4.3%), Indonesia (3.9%), the Neutral Zone (of Kuwait and Saudi Arabia) (3.7%), and China (1.7%). Imports of crude petroleum were valued at $45.8 billion (Ministry of Economy, Trade and Industry, 2003d, p. 32-34; Ministry of Finance, 2003b, p. 172-173).

In 2003, refined petroleum products were produced by 18 oil companies that operated 32 refineries with a total capacity of 4.7 million barrels per day. In December 2002, Nippon Mitsubishi Petroleum Refining Co. Ltd. formed a strategic alliance with Idemitsu Kosan Co. Ltd. to reduce costs and coordinate distribution of refined products. As a result, Idemitsu shut down the 80,000-barrel-per-day (bbl/d) Hyogo refinery in April 2003 and its 110,000-bbl/d Okinawa refinery in November (U.S. Energy Information Administration, 2004§).

In 2003, domestic demand for refined petroleum, by product, was as follows: heavy fuel oil, 389 Mbbl; gasoline, 378 Mbbl; naphtha, 309 Mbbl; diesel (distillate fuel oil), 241 Mbbl; kerosene, 187 Mbbl; jet fuel, 28 Mbbl; asphalt, 24 Mbbl; lubricants, 13 Mbbl; and paraffin wax, 474,000 barrels (bbl). To meet its domestic demand, Japan imported a total of 242 Mbbl of refined petroleum products in 2003. The imported refined petroleum products included 187 Mbbl of naphtha, 20 Mbbl of kerosene, 19 Mbbl of heavy fuel oil, 11 Mbbl of gasoline, 5 Mbbl of diesel, 588,000 bbl of jet fuel, 307,000 bbl of lubricants, and 42,000 bbl of paraffin wax (Ministry of Economy, Trade and Industry, 2003d, p. 84-85).

In 2003, consumption of domestically produced natural gas was by gas (49.0%), electric power (19.2%), oil and gas (13.9%), chemical (12.1%), and other manufacturing and service (5.7%) industries. Additionally, Japan consumed 53.6 Mt (80.3 billion cubic meters) of imported natural gas in the form of LNG for consumption mostly by the electric power industry for power generation (70%) and for gas and industrial use (30%) (Ministry of Economy, Trade and Industry, 2003d, p. 28-29, 122).

At the end of 2003, Japan's stockpile of crude petroleum and partially refined and refined petroleum products totaled 165 days of supply, of which the national stockpile was 87 days, and the private stockpile, 78 days (Ministry of Economy, Trade and Industry, 2003d, p. 152-153).

Reserves

Japan's reserves of limestone and other industrial minerals, such as dolomite, iodine, pyrophyllite, and silica stone, were large. Coal reserves were substantial, but not large, and very costly to produce in Japan. With the exception of gold and zinc, ore reserves for metallic minerals and other minerals, especially oil and gas, are negligible (table 3).

Infrastructure

Japan had one of the most modern and complete infrastructures for its mining and mineral-processing industries in the world. Despite its small land area, Japan had a highway system of 1.16 million kilometers, of which 534,000 kilometers (km) was paved, and 627,000 km, unpaved. The railroad network had 23,700 km, of which 20,400 km was 1.067-meter (m) narrow gauge (13,200 km of which was electrified), 3,200 km was 1.435-m standard gauge (all electrified), 77 km was 1.372-m narrow gauge (all electrified), and 11 km was 0.762-m narrow gauge (all electrified). Highway and railroad networks link all major seaports and coastal cities on the four major islands. The networks also connect Honshu to Kyushu and Shikoku Islands in the south and Hokkaido Island in the north by means of bridges and tunnels.

Japan's domestic and international telecommunication services were among the best in the world with land and mobile phone services; satellite earth stations [five Intelsat (four in the Pacific Ocean and one in the Indian Ocean), one Intersputnik (in the Indian Ocean), and one Inmarsat (in the Indian and Pacific Oceans)]; submarine cables to China, the Philippines, Russia, and the United States (via Guam); and 73 Internet service providers (as of 2000). For electric power transmission, Japan had a route length of 94,000 km and a circuit length of 166,000 km (as of 2001). For power distribution, Japan's total length of line distances, which included high- and low-voltage, was 1.23 million kilometers (as of 2001) concentrated in the major industrial areas of Fukuoka, Hiroshima, Nagoya, Osaka, Takamatsu, Tokyo, and Toyama. Japan also had an extensive pipeline system comprising 2,719 km for natural gas, 170 km for oil, and 60 km for oil, gas, and water (as of 2003).

Japan had 27 major ports and more than 2,000 minor ports to receive raw materials from overseas and to export manufactured products. The major port facilities, which included terminals and warehouses, were among the most indispensable parts of the infrastructure for the mineral industry because of their role in receiving imported raw materials, such as coal, crude petroleum, iron ore, LNG, nonferrous ore, and phosphate rock for mineral-processing plants and powerplants, as well as exporting value-added mineral and metal products. The important seaports of the major mineral processing centers were Akita, Amagasaki, Chiba, Hachinohe, Higashi-Harima, Himeji, Hiroshima, Kawasaki, Kobe, Mizushima, Nagoya, Osaka, Sakai, Shimizu, Tokyo, and Yokohama on Honshu (Main Island); Fukuoka, Kita Kyushu, Moji, and Oita on Kyushu Island; Hakodate, Kushiro, Muroran, and Tomakomai on Hokkaido Island; and Sakaide on Shikoku Island.

Japan had 174 airports and 15 heliports in 2003. The major international airports were Fukuoka, Haneda (Tokyo), Kansai, Nagoya, Narita (New Tokyo), and Osaka. Japan's round-the-clock airport, Kansai International, sits on reclaimed offshore land in Osaka Bay.

Outlook

Japan's economic recovery is expected to continue at a faster pace in 2004 and then at a slower pace in 2005. GDP growth was forecasted to increase to 3.4% in 2004 and 1.9% in 2005 (International Monetary Fund, 2004§). Domestic mining activities, especially in the industrial minerals sector, are expected to increase slightly in 2004. Metal production of copper and zinc is expected to increase as domestic demand for the metals continues its upward trend in 2004. Production of crude steel is expected to remain above the 110-Mt level in 2004 because of the continued strong demand in the Japanese automobile and machinery and equipment sectors and anticipated increases in exports to Southeast Asia in 2004. Production of titanium sponge metal is expected to increase in 2004 because of increased exports owing to the recovery of commercial airline business in the United States and Europe. Production of cement and limestone is expected to increase slightly in 2004 owing to increasing construction activities in late 2003 and early 2004.

To sustain its economic health and to prevent another economic recession, Japan is expected to continue exporting more ferrous and nonferrous metals, cement clinker, and cement to ASEAN countries, China, the Republic of Korea, and Taiwan where the economies are expected to continue to improve in the coming years. Imports of coal, nonferrous metals, and other minerals are expected to increase in 2004 when the economic recovery moves to higher gear.

In line with its mineral policy to secure and diversify its long-term supply of raw materials, which will ensure a steady economic growth, Japan is expected to continue its active search for direct investment in joint exploration and development of minerals in developed and developing countries, especially in Australia, Canada, Chile, China, Indonesia, Mexico, Peru, the Philippines, and the United States. The targeted minerals were antimony, chromium, coal, columbium (niobium), copper, gold, iron ore, lead, lithium, manganese, molybdenum, natural gas, nickel, crude petroleum, rare earths, silver, strontium, tantalum, titanium, tungsten, vanadium, and zinc.

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TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003[p]
METALS						
Aluminum:						
Alumina	thousand tons	335	369	331	333	330 [e]
Aluminum hydroxide	do.	737	782	739	724	740 [e]
Metal:						
Primary:						
Regular grades	do.	11	7	7	6	6 [e]
High-purity	do.	35	41	27	40	44
Secondary[2]	do.	1,158	1,214	1,171	1,239	1,200 [e]
Antimony:						
Oxide		10,348	11,051	8,789	9,052	8,235
Metal		178	146	101	183	121
Arsenic, high-purity[e]		110	100	100	100	100
Bismuth		481	520	551	474	513
Cadmium, refined		2,567	2,472	2,460	2,444	2,509
Chromium, metal[e]		700	750	1,350	1,600	1,500
Cobalt, metal		247	311	350	354	379
Copper:						
Mine output, Cu content		1,038	1,211	744	--	--
Metal:						
Blister and anode:						
Primary		1,256,276	1,331,352	1,328,489	1,317,291	1,343,353
Secondary		133,188	149,282	139,764	182,069	172,724
Total		1,389,464	1,480,634	1,468,253	1,499,360	1,516,077
Refined:						
Primary		1,215,248	1,290,091	1,287,165	1,211,111	1,251,728
Secondary		126,301	147,260	138,526	189,968	178,637
Total		1,341,549	1,437,351	1,425,691	1,401,079	1,430,365
Gallium, metal:						
Primary[e]		12	14	8	8	9
Secondary		47	56	62 [r]	80 [r]	83
Germanium:						
Oxide[e]		10	10	10	10	10
Metal	kilograms	765	1,809	1,615	803	621
Gold:						
Mine output, Au content	do.	9,405	8,400	7,815	8,615	8,143
Metal:						
Primary	do.	147,719	146,061	155,826	144,748	161,399
Secondary[3]	do.	20,107	19,280	19,831	21,160 [r]	22,549
Total	do.	167,826	165,341	175,657	165,908 [r]	183,948
Indium, metal	do.	40,465	55,078	55,000 [e]	60,000 [r]	70,000
Iron and steel:						
Iron ore and iron sand concentrate:						
Gross weight		1,450	1,454	750	700 [e]	700 [e]
Fe content		589	523	258	240 [e]	240 [e]

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003[p]
METALS--Continued						
Iron and steel--Continued:						
Metal:						
Pig iron and blast furnace ferroalloys	thousand tons	74,520	81,071	78,836	80,979	82,091
Electric-furnace ferroalloys:						
Ferrochrome		119,777	130,074	111,167	91,937	19,427
Ferromanganese		315,152	337,694	368,293	356,717	371,831
Ferronickel		332,293	367,181	367,739	370,973	369,099
Ferrosilicon		1,452	--	--	--	--
Silicomanganese		65,744	67,926	62,238	70,965	58,043
Other:						
Ferromolybdenum		3,391	3,699	3,485	2,375	2,691
Ferrotungsten		43	42	109	9	12
Ferrovanadium		3,349	4,108	3,613	3,592	3,491
Unspecified		6,077	7,171	5,733	6,376	3,813
Total		847,278	917,895	922,377	902,944	828,407
Steel, crude	thousand tons	94,192	106,444	102,866	107,745	110,511
Semimanufactures, hot-rolled:						
Ordinary steels	do.	73,221	83,044[r]	78,927	80,838[r]	81,769
Special steels	do.	14,224	15,747	15,835	17,451[r]	18,735
Lead:						
Mine output, Pb content		6,074	8,835	4,997	5,723	5,660
Metal, refined:						
Primary		125,514	129,469	127,358	107,744	105,460
Secondary		167,915	182,209	175,088	178,016	189,831
Total		293,429	311,678	302,446	285,760	295,291
Magnesium, metal, secondary[e]		7,732[4]	10,000	10,000	9,000	10,000
Manganese, oxide		57,993	63,379	51,095	45,867	49,115
Molybdenum, metal		586	626	610	465	561
Nickel metal:						
Refined		30,481	36,230	32,526	32,303	34,991
Ni content of nickel oxide sinter		34,482	47,020	49,600	48,950	52,700
Ni content of ferronickel		67,166	74,753	68,113	74,418	74,804
Ni content of chemical		2,570	2,721	2,394	1,820	2,084
Total		134,699	160,724	152,633	157,491	164,579
Platinum-group metals:						
Palladium, metal	kilograms	5,354	4,712	4,805	5,618	5,500[e]
Platinum, metal	do.	737	782	791	762	770[e]
Rare-earth oxides[5]		5,092	5,619	5,109	5,423	5,521
Selenium, metal		546	612	735	752	734
Silicon, high-purity		3,844	4,688	4,334	4,457	5,045
Silver:						
Mine output, Ag content	kilograms	94,004	103,781	80,397	81,416	78,862
Metal:						
Primary	do.	2,257,888	2,384,739	2,293,028	2,259,551	2,453,204
Secondary[3]	do.	503,938	345,358	303,804	291,955[r]	258,754
Total	do.	2,761,826	2,730,097	2,596,832	2,551,506[r]	2,711,958
Tantalum, metal[e]		85	85	90	90	95
Tellurium, metal		35	36	39	29	33
Tin, metal, smelter		568	593	668	659	662

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003[p]
METALS--Continued						
Titanium:						
Dioxide		269,193	270,272	256,961	240,469	253,453
Metal		18,928 [r]	19,457 [r]	24,906 [r]	25,199 [r]	18,923
Tungsten, metal		4,357	4,993	3,607	3,302	3,333
Vanadium, metal[e, 6]		250	250	250	250	250
Zinc:						
Mine output, Zn content		64,263	63,601	44,519	42,851	44,574
Oxide		78,928	82,816	75,414	74,515	75,090
Metal:						
Primary		524,979	541,704	541,277	547,183	532,704
Secondary		158,637	157,047	142,777	126,723	153,411
Total		683,616	698,751	684,054	673,906	686,115
Zirconium, oxide		7,660	8,540	7,930	8,650 [r]	8,800 [e]
INDUSTRIAL MINERALS						
Asbestos[e]		18,000	18,000	18,000	18,000	18,000
Bromine[e]		15,000	15,000	15,000	20,000	20,000
Cement, hydraulic	thousand tons	80,120	81,097	76,550	71,828	68,766
Clays:						
Bentonite		428,247	415,115	405,738	437,772 [r]	425,945 [e]
Fire clay, crude		558,110	506,314	475,665	480,000 [e]	460,000 [e]
Kaolin		53,092	25,739	19,976	11,756 [r]	12,409
Diatomite[e]		190,000	190,000	180,000	180,000	185,000
Feldspar and related materials:[e]						
Feldspar		52,000	52,000	50,000	50,000	50,000
Aplite		330,000	330,000	310,000	403,000 [r]	300,000
Gypsum	thousand tons	5,549	5,917	5,874	5,644	5,764
Iodine		6,152	6,157	6,643	6,548	6,524
Lime, quicklime	thousand tons	7,594	8,106	7,586	7,420	7,953
Nitrogen, N content of ammonia	do.	1,385	1,410	1,318	1,192	1,061
Perlite[e]		260,000	250,000	255,000	250,000	250,000
Salt, all types	thousand tons	1,327	1,374	1,358	1,282 [r]	1,263
Silica sand	do.	6,088	6,121	5,768	4,893 [r]	4,699
Sodium compounds, n.e.s.:						
Soda ash		721,752	669,203	461,204	410,000 [r]	400,000 [e]
Sulfate, anhydrous		174,139	163,057	146,780	137,713	132,807
Stone, crushed:						
Dolomite	thousand tons	3,648	3,539	3,389	3,450	3,579
Limestone	do.	180,193	185,569	182,255	170,166 [r]	163,565
Stone, quartzite	do.	15,548	15,578	14,213	13,568 [r]	12,838
Sulfur:						
S content of pyrite	do.	41	30	30	20	20
Byproduct of metallurgy	do.	1,363	1,384	1,319	1,326	1,281
Byproduct of petroleum	do.	2,054	2,071	2,024	1,865	1,951
Talc and related materials:						
Talc[e]		50,000	50,000	45,000	40,000	40,000
Pyrophyllite		694,317	692,998	623,097	600,000 [e]	600,000 [e]
Vermiculite[e]		15,000	15,000	15,000	15,000	15,000

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003[p]
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand tons	761	788	742	755	788
Coal, bituminous[7]	do.	3,906	3,126	3,198	1,367	1,400 [e]
Coke including breeze, metallurgical	do.	36,473	38,394	38,402	38,417	38,544
Gas, natural:						
Gross[8]	million cubic meters	2,280	2,453	2,521	2,571	2,844
Marketed	do.	2,362	2,507	2,602	2,662	3,011
Petroleum:						
Crude	thousand 42-gallon barrels	4,592	4,656	4,782	4,548	5,161
Refinery products:						
Gasoline:						
Aviation[e]	do.	104	45	40	40	50
Other	do.	353,730	356,530	364,714	364,129	367,687
Asphalt and bitumen	do.	33,909 [r]	33,366 [r]	33,151 [r]	31,537 [r]	32,586
Distillate fuel oil	do.	280,122	268,022	261,851	250,932	242,311
Jet fuel	do.	65,732	66,828	67,320	65,263	60,013
Kerosene	do.	167,744	175,399	176,655	169,472	177,963
Liquefied petroleum gas	do.	56,504 [r]	57,251 [r]	59,942 [r]	53,593 [r]	53,107
Lubricants	do.	16,939	16,677	16,304	16,630	16,314
Naphtha	do.	113,080	112,935	116,122	119,298	122,355
Paraffin, wax	do.	860 [r]	855 [r]	822 [r]	833 [r]	915
Petroleum coke	do.	3,710	4,274 [r]	4,700	4,549 [r]	4,000
Refinery fuel and losses[e, 9]	do.	150,000	150,000	150,000	150,000	150,000
Residual fuel oil	do.	435,916	429,153	409,780	398,673	435,763
Unfinished oils[e]	do.	50,000	50,000	50,000	50,000	50,000
Total[10]	do.	1,730,000	1,720,000	1,710,000	1,670,000	1,710,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. [r] Revised. -- Zero.

[1] Table includes data available through October 27, 2004.

[2] Includes unalloyed and alloyed ingot.

[3] Includes recovered from scrap and waste.

[4] Reported figure.

[5] Includes oxide of cerium, europium, gadolinium, lanthanum, neodymium, praseodymium, samarium, terbium, and yttrium.

[6] Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.

[7] Includes small amount of anthracite in 1998-2001. All major coal mines had closed by January 2002, but 12 smaller mines were still in operation in 2003.

[8] Includes output from gas wells and coal mines.

[9] May include some additional unfinished oils.

[10] Data are rounded to three significant digits; may not add to totals shown.

Sources: Ministry of Economy, Trade and Industry—Yearbook of Iron and Steel, Non-ferrous Metal, and Fabricated Metals Statistics, 2003; Yearbook of Chemical Industries Statistics, 2003; Yearbook of Ceramics and Building Materials Statistics, 2003; and Yearbook of Mineral Resources and Petroleum Products Statistics, 2003. Japan Aluminum Association—Aluminum Statistics, 2003. Arumu Publishing Co. Ltd.—Industrial Rare Metals Annual Review No. 120, 2004.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aso Cement Co. Ltd.	Tagawa and Kanda, Fukuoka Prefecture	2,400
Do.		Daiichi Cement Co. Ltd.	Kawasaki, Kanagawa Prefecture	1,169
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762
Do.		Hachinohe Cement Co. Ltd.	Hachinohe, Aomori Prefecture	1,533
Do.		Hitachi Cement Co. Ltd.	Hitachi, Ibaraki Prefecture	941
Do.		Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Apmori Prefecture; Higashiyama, Higashiiwai-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075
Do.		Myojo Cement Co. Ltd.	Itoigawa, Niigata Prefecture	2,482
Do.		Nippon Steel Chemical Co. Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co. Ltd.	Muroran, Hokkaido Prefecture	1,589
Do.		Ryukyu Cement Co. Ltd.	Yabu, Nago, Okinawa Prefecture	722
Do.		Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Chichibu, Kumagaya, and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Saiki and Tsukumi, Oita Prefecture; Kamiiso, Hokkaido Prefecture; Tosa, Kochi Precture; and Kawara, Fukuoka Prefecture	29,904
Do.		Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,936
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube, Isa, Yamaguchi Prefecture; and Kanda, Fukuoka Prefecture	10,736
Coal		Kushiro Coal Mine Co. Ltd.[1]	Kushiro, Hokkaido Prefecture	800
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	600
Copper, refined	do.	Hibi Kyodo Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 64%; Nittetsu Mining Co. Ltd., 20%; and Furukawa Co. Ltd., 16%)	Tamano, Okayama Prefecture	218,400
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Nippon Mining and Metals Co. Ltd. (wholly owned subsidiary of Nikko Kyodo Co. Ltd.)	Hitachi, Ibaraki Prefecture; Saganoseki, Oita Prefecture	452,400
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd., 4.17%; Mitsubushi Materials Corp., 49.29%; Mitsubishi Cable Indutries, Ltd., 4.17%; and others, 2.91%)	Onahama, Fukushima Prefecture	258,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Besshi/Toyo (Saijyo), Ehime Prefecture	300,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold:				
In concentrate	kilograms	Sumitomo Metal Mining Co. Ltd.	Hishikari, Kagoshima Prefecture	9,000
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	24,000
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	Nippon Mining and Metals Co. Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2--Continued

JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Limestone		Mitsubishi Materials Corp.	Higashitani, Fukuoka Prefecture	10,000
Do.		Nittetsu Mining Co. Ltd.	Torigatayama, Kochi Prefecture; Hanezuru, Tochigi Prefecture; and Shiriya, Aomori Prefecture	23,000
Do.		Sumikin Mining Co., Ltd.	Hachinohe Sekkai, Aomori Prefecture	5,500
Do.		Sumitomo-Osaka Cement Co. Ltd.	Ibuku, Shiga Prefecture and Karazawa, Tochigi Prefecture	4,000
Do.		Shuho Mining Co., Ltd.	Sumitomo Cement Shuho, Yamaguchi Prefecture	8,200
Do.		Taiheiyo Cement Co. Ltd.	Ofunato, Iwate Prefecture; Ganji and Tsukumi, Oita Prefecture; Garo, Hokkaido Prefecture; Kawara, Fukuoka Prefecture, Tosayama, Kochi Prefecture; Taiheiyo Buko, Saitama Prefecture; and Shigeyasu, Yamaguchi Prefecture	46,000
Do.		Todaka Mining Co. Ltd.	Todaka-Tsukumi, Otia Prefecture	12,000
Do.		Ube Kosan Co. Ltd.	Ube Isa, Yamaguchi Prefecture	9,000
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (Asahi Glass Co. Ltd., 52.4%; and Mitsubishi Corp., 11.2%)	Oami-Shirasato and Ichinomya, Chiba Prefecture; and Sadowara, Miyazaki Prefecture	3,600
Do.	do.	Godo Shigen Sangyo Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 11%; and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Kanto Natural Gas Development Co. Ltd. (Mitsui Chemicals, Inc., 21.9%; and Godo Shigen Sangyo Co. Ltd., 14.3%)	Mobara, Chiba Prefecture	1,200
Do.	do.	Nihon Tennen Gas Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 50%; and Tomen Corp., 41%)	Shirako and Yokoshiba, Chiba Prefecture	1,200
Do.	do.	Toho Earthtech, Inc. (Itochi Corp., 34.1%; Mitsubishi Gas Chemical Co. Ltd., 32.2%; and Nippon Light Metal Co. Ltd., 31.1%)	Kurosaki, Niigata Prefecture	720
Do.	do.	Nippoh Chemicals Co. Ltd. (Nippon Shokubai Co. Ltd., 17%; Takeda Chemical Industries Ltd., 16.4%; and Chugai Boyeki Co. Ltd., 13.6%)	Isumi, Chiba Prefecture	720
Lead:				
In concentrate		Toyoha Mining Co. Ltd. (wholly owned subsidiary of Nippon Mining and Metals Co. Ltd.)	Toyoha, Hokkaido Prefecture	6
Refined	metric tons	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	120,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	30,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Hosokura Smelting and Refining Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.)[2]	Hosokura, Miyagi Prefecture	21,600
Manganese, electrolytic dioxide		Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	24
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	34

See footnotes at end of table.

TABLE 2--Continued

JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. (wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd.)	Hyuga, Miyazaki Prefecture	21,000
Do.	do.	Nippon Yakin Kogyo Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	60,000
Refined	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000
Pyrophyllite		Goto Kozan Co. Ltd.	Goto, Nagasaki Prefecture	204
Do.		Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Sankin Kogyo Co. Ltd.	Otsue, Hiroshima Prefecture	72
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.		Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
Do.		Showa Kogyo Co. Ltd.	Showa-Shokozan, Hiroshima Prefecture	60
Steel, crude		JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)	Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.		Nippon Steel Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.		Sumitomo Metal Industries, Ltd.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
Titanium:				
In sponge metal		Sumitomo Titanium Corp. (Sumitomo Metal Industries Ltd., 75.2%; and Kobe Steel Ltd., 24.8%)	Amagasaki, Hyogo Prefecture	18
Do.		Toho Titanium Co. Ltd. (Nippon Mining and Metals Co. Ltd., 47%; Mitsui & Co. Ltd., 20%; and others, 33%)	Chigasaki, Kanagawa Prefecture	13
In dioxide	metric tons	Fuji Titanium Industry Co. Ltd. (Ishihara Sangyo Kaishia Ltd., 24.8%; and others, 75.2%)	Kobe, Hyogo Prefecture	17,400
Do.	do.	Furukawa Co. Ltd.	Osaka, Osaka Prefecture	13,200
Do.	do.	Ishihara Sangyo Kaisha Ltd.	Yokkaichi, Mie Prefecture	154,800
Do.	do.	Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	60,000
Do.	do.	Tayca Corp.	Saidaiji, Okayama Prefecture	60,000
Do.	do.	Titan Kogyo Kabushiki Kaisha	Ube, Yamaguchi Prefecture	16,800
Do.	do.	Tohkem Products Corp.	Akita, Akita Prefecture	30,000
Zinc:				
In concentrate		Toyoha Mining Co. Ltd.	Toyoha, Hokkaido Prefecture	45
Refined	metric tons	Akita Smelting Co. Ltd. (Dowa Mining Co. Ltd., 57%; Nippon Mining and Metals Co. Ltd., 24%; Sumitomo Metal Mining Co. Ltd., 14%; and Mitsubushi Materials Corp., 5%)	Iijima, Akita Prefecture	200,400
Do.	do.	Hachinohe Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 57.7%; Nippon Mining and Metals Co. Ltd., 27.8%; and Toho Zinc Co. Ltd. and Nisso Smelting Co. Ltd., 14.5%)	Hachinohe, Aomori Prefecture	117,600
Do.	do.	Hikoshima Smelting Co. Ltd.	Hikoshima, Yamaguchi Prefecture	84,000
Do.	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	72,000
Do.	do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	90,000

[1] Coal mining operation continued, following establishment of Kushiro Coal Mining Co. Ltd. in 2002.

[2] Mitsubishi Materials Corp. suspended operations of its secondary lead smelter at Hosokura in June 2002.

TABLE 3
JAPAN: RESERVES OF MAJOR MINERAL COMMODITES IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Coal[1]		785,000
Copper ore, Cu content		36
Dolomite[2]		1,400,000
Gold ore, Au content	kilograms	179,000
Iodine		5,000 [e]
Lead ore, Pb content		623
Kaolin		35,000
Limestone[3]		60,700,000
Pyrophyllite		160,000
Silica sand[4]		201,000
Silica stone, white[5]		881,000
Silver ore, Ag content		2,390
Zinc ore, Zn content		3,250

[e] Estimated.

[1] Recoverable reserves, including 17 million metric tons of lignite.

[2] Average ore grade is 17.9% MgO.

[3] Average ore grade is 53.8% CaO.

[4] Average ore grade is 78.0% SiO_2.

[5] Average ore grade is 92.8% SiO_2.

Source: Research Institute of Economy, Trade and Industry.

TABLE 4
JAPAN: MINERALS TRADE[1]

(Million dollars)

		Imports			Exports		
Code	Commodity	2001	2002	2003	2001	2002	2003
25	Salt, sulfur, earths and stone, lime, plastering materials, cement	1,345	1,176	1,220	286	301	374
26	Ferrous and nonferrous metal ores, slag, ash	6,486	6,511	7,482	29	30	40
27	Mineral fuels, mineral oils, and products of their distillation; bituminous substances; mineral waxes	70,368	65,664	81,054	1,508	1,403	1,555
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements, or of isotopes	2,941	2,942	3,458	1,814	1,934	2,292
31	Fertilizers	482	526	530	81	84	86
68	Articles of stone, plaster, cement, asbestos, mica, or similar materials	1,062	1,085	1,150	831	855	1,016
69	Ceramic products	643	647	760	1,100	860	912
70	Glass and glassware	1,218	1,202	1,362	2,326	2,413	2,788
71	Natural or cultured pearls; precious or semiprecious stones; precious metals, metals clad with precious metals and articles thereof; imitation jewellery; coins	5,937	5,698	5,705	1,698	1,636	2,149
72	Iron and steel	2,481	2,185	3,093	11,159	13,160	15,717
73	Articles of iron and steel	2,363	2,455	2,852	5,708	5,821	6,225
74	Copper and articles thereof	812	692	761	2,247	2,270	2,388
75	Nickel and articles thereof	905	927	1,384	311	324	458
76	Aluminum and articles thereof	4,879	4,533	5,447	1,323	1,434	1,722
78	Lead and articles thereof	36	19	18	9	20	18
79	Zinc and articles thereof	89	41	63	88	107	89
80	Tin and articles thereof	115	113	156	46	53	56
81	Other base metals, cermets, articles thereof	766	622	840	619	540	643
	Total	102,928	97,038	117,335	31,183	33,245	38,528
	Total trade	349,099	337,550	382,761	403,121	416,538	470,650

[1] Values have been converted from Japanese yen (¥) to U.S. dollars at a rate of ¥121.5=US$1.00 for 2001, ¥125.4=US$1.00 for 2002, and ¥115.9=US$1.00 for 2003.

Source: Ministry of Finance, Japan Exports & Imports, Commodity by Country, December 2001-03.

TABLE 5
JAPAN: OVERSEAS ALUMINUM SMELTING PROJECTS IN 2003

Company/project name and country	Annual capacity (metric tons) Total	Annual capacity (metric tons) Japanese share	Type of power	Production started	Shipment to Japan started	Major equity holder and/or other holders	Participating Japanese companies and their equity share
New Zealand Aluminium Smelters Ltd., New Zealand	313,000	67,600	Hydro	April 1971	July 1971	Comalco New Zealand Ltd., 79.36%	Sumitomo Chemical Co. Ltd., 20.64%.
Alcan Smelters and Chemical Ltd., Canada	90,000	45,000	do.	NA	January 1977	Alcan Aluminum Ltd. of Canada, 50%	Nippon Light Metal Co. Ltd., 50%.
Intalco Aluminum Corp.,[1] United States	272,000	106,000	do.	1966	NA	Alcoa Inc., 61%	Mitsui & Co., Ltd., 32%; and YKK Corp., 7%.
Eastalco Aluminum Co.,[1] United States	174,000	68,000	Thermal	1970	do.	do.	do.
Industria Venezolana de Aluminio C.A., Venezuela	450,000	90,000	Hydro	February 1978	December 1978	Corp. Venezolana de Guayana (CVG) of Venezuela, 80%	Showa Denko K.K., 7%; Sumitomo Chemical Co. Ltd., 4%; Kobe Steel Ltd., 4%; Mitsubishi Materials Corp., 3%; Mitsubishi Aluminum Co. Ltd., 1%; and Marubeni Corp., 1%.
P.T. Indonesia Asahan Aluminum, Indonesia	225,000	133,000	do.	February 1982	October 1982	Indonesian Government, 41%	Nippon Asahan Aluminium Co. Ltd. (a 13-member Japanese consortium), 59%.
Boyne Island Smelter Ltd., reduction lines 1, 2, Australia	260,000	130,000	Thermal	do.	July 1982	Comalco Ltd. of Australia, 59.5%	Sumitomo Light Metal Co. Ltd., 17%; Ryowa Development Pty. Ltd., 9.5%; YKK Aluminum Pty. Ltd., 9.5%; and Sumitomo Chemical Co. Ltd., 4.5%.
Boyne Island Smelter Ltd., reduction line 3, Australia	230,000	94,000	do.	July 1997	October 1997	Comalco Ltd. of Australia, 59.25%	Sumitomo Light Metal No. 2 Co. Pty. Ltd., 17%; Ryowa Development II Pty. Ltd., 14.25%; and YKK Aluminium Pty. Ltd., 9.5%.
Alcoa of Australia Ltd., Australia	350,000	80,500	do.	November 1986	NA	Alcoa of Australia, 45%; Eastern Aluminum Co., 10%; China International Trust & Investment Corp., 22%	Marubeni Corp., 23%.
Aluminio Brasileiro S.A., Brazil	400,000	196,000	Hydro	July 1985	November 1986	Companhia Vale do Rio Doce, 51%	Nippon Amazon Aluminum Co. (a 32-member Japanese consortium), 49%.
Mozambique Aluminum Co.,[2] Mozambique	250,000	63,000	do.	June 2000	NA	Billiton plc, 47.11%; Industrial Development Corp. of South Africa, 24.04%; Government of Mozambique, 3.85%	Mitsubishi Corp., 25%.
Aluminerie Alouette Inc.,[3] Canada	243,000	46,000	do.	June 1992	September 1992	Alcan, 40%; Austria Metal AG, 20%; Hydro Aluminium, 20%; Societe Generale de Financement du Duebec, 13.33%	Marubeni Corp., 6.67%.

NA not available.

[1] The two smelters under Intalco Aluminum Corp. and Eastalco Aluminum Co. were acquired by Alcoa Inc. in July 1998.

[2] Phase 2 will add an additional 253,000 metric tons per year (t/yr) of aluminum capacity by 2003.

[3] Capacity will be expanded to 500,000 t/yr in fall 2005 from 243,000 t/yr.

Sources: Japan Aluminum Association, Japan Overseas Aluminun Smelting Projects; U.S. Geological Survey, Primary Aluminum Plants Worldwide—1998, Part I—Detail, p. 4, 22, and 155; Marubeni Corp.

TABLE 6
JAPAN: DEMAND FOR GOLD AND SILVER

Item		1999	2000	2001	2002	2003
Gold:						
Dental and medical	kilograms	19,856	21,221	20,813	21,765	22,373
Electrical, electronic, and communication	do.	82,485	106,086	70,916	80,415	85,112
Gold plating	do.	24,153	24,993	22,615	22,513	23,512
Jewelry	do.	45,042	43,119	37,512	37,128	20,489
Decorations and badges	do.	1,623	1,678	1,474	1,392	1,499
Pottery and porcelain	do.	1,210	1,005	975	1,149	1,532
Fountain pens	do.	15	12	14	15	15
Watches	do.	712	768	778	785	790
Industrial arts and crafts	do.	4,112	4,222	4,893	4,697	4,879
Private hoarding	do.	110,712	52,417	69,586	85,569	79,481
Other	do.	47,157	39,257	32,919	47,755	48,317
Total	do.	337,077	294,778	262,495	303,183	287,999
Silver:						
Silver nitrate for photography	metric tons	1,633	1,726	1,663	1,531	1,364
Silver nitrate for other uses	do.	274	335	150	219	295
Electrical contacts	do.	199	313	202	152	218
Brazing alloy	do.	139	139	111	98	94
Electroplating	do.	76	--	--	--	--
Rolled products	do.	155	298	193	216	228
Jewelry and silverware	do.	50	--	--	--	--
Other	do.	569	1,215	636	455	474
Total	do.	3,095	4,026	2,955	2,671	2,673

-- Zero.

Source: Arumu Publishing Co. Ltd., Industrial Rare Metals Annual Reviews, nos. 118, 119, and 120.

TABLE 7
JAPAN: DOMESTIC ORDERS FOR ORDINARY AND SPECIALTY STEEL PRODUCTS, BY END USE

(Thousand metric tons)

End use	1999	2000	2001	2002	2003
Automobiles:					
Ordinary steel	8,211	9,310	9,430	10,310	10,580
Specialty steel	2,363	2,660	2,590	2,990	3,230
Total	10,574	11,970	12,020	13,300	13,810
Construction:					
Ordinary steel	13,360	14,060	13,550	13,580	13,300
Specialty steel	714	780	720	640	710
Total	14,074	14,840	14,270	14,220	14,010
Conversion and processing:					
Ordinary steel	3,079	3,090	2,910	2,790	2,760
Specialty steel	3,092	3,400	3,260	3,560	3,880
Total	6,171	6,490	6,170	6,350	6,640
Electric machinery and equipment:					
Ordinary steel	1,954	2,190	1,940	1,840	1,940
Specialty steel	108	140	130	130	160
Total	2,062	2,330	2,070	1,970	2,100
Home and office appliances:					
Ordinary steel	522	610	550	540	580
Specialty steel	175	200	210	200	200
Total	697	810	760	740	780
Industrial machinery and equipment:					
Ordinary steel	1,171	1,330	1,290	1,360	1,650
Specialty steel	996	1,070	940	980	1,180
Total	2,167	2,400	2,230	2,340	3,830
Shipbuilding and marine equipment:					
Ordinary steel	2,881	3,130	3,480	3,420	3,530
Specialty steel	69	120	140	180	210
Total	2,950	3,250	3,620	3,600	3,740
Steel dealers:					
Ordinary steel	18,099	20,030	17,930	17,480	17,070
Specialty steel	1,077	1,280	1,230	1,210	1,350
Total	19,176	21,310	19,160	18,690	18,420
Tanks and containers:					
Ordinary steel	1,750	1,740	1,620	1,560	1,600
Specialty steel	13	20	20	20	20
Total	1,763	1,760	1,640	1,580	1,620
Other:					
Ordinary steel	488	610	570	500	410
Specialty steel	108	110	110	110	120
Total	596	720	680	610	530
Total domestic demand:					
Ordinary steel	51,510	56,100	53,270	53,380	53,420
Specialty steel	8,715	9,780	9,350	10,020	11,060
Grand total	60,225	65,880	62,620	63,400	64,480

Source: The Steel Industry of Japan 2002-2004, The Japan Iron and Steel Federation.

TABLE 8
JAPAN: EXPORTS OF IRON AND STEEL PRODUCTS, BY COUNTRY OF DESTINATION

(Thousand metric tons)

Destinations	1999	2000	2001	2002	2003
Asia:	20,729	22,405	23,037	30,339	29,093
China	2,960	4,062	4,566	6,532	6,435
Hong Kong	1,641	1,735	1,363	1,542	1,207
Indonesia	927	989	969	1,164	926
Korea, Republic of	5,366	6,029	6,537	9,198	8,978
Malaysia	1,616	1,464	1,515	1,704	1,741
Taiwan	3,080	2,557	2,528	3,263	3,280
Thailand	2,553	2,793	2,572	3,350	3,593
Singapore	900	776	700	760	598
Other countries	1,686	2,000	2,287	2,826	2,335
Middle East	1,283	1,090	1,523	1,074	1,172
Europe	1,004	854	1,193	715	742
Americas:	4,313	4,000	3,808	3,097	2,340
Argentina	90	8	55	62	6
Brazil	34	41	31	44	33
Canada	443	499	244	315	231
Colombia	110	176	246	190	183
United States	2,803	2,137	2,206	1,485	1,076
Venezuela	30	52	57	38	7
Other countries	803	1,087	969	963	804
Africa	339	371	365	432	364
Oceania:	544	441	553	666	700
Australia	483	382	498	593	639
New Zealand	57	50	43	63	65
Other countries	4	9	12	10	6
Grand total	28,212	29,161	30,478	36,323	34,411

Source: The Japan Iron and Steel Federation, Monthly Report of the Iron and Steel Statistics, v. 47, no. 3, March 2004, p. 14-17.

TABLE 9

JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s, AN UPDATE IN 2003

	Australia		Canada, British Columbia	
	McArthur River, Northern Territory	Northparkes, New South Wales	Mount Polley[1]	Huckleberry
Nature of project involvement	Investment in exploration and development	Investment in exploration and development	Equity participation	Equity participation and provided loan.
Participating Japanese companies and their equity share	Nippon Mining and Metals Co. Ltd., 15%; Mitsui and Co. Ltd., 5%; Mitsubishi Materials Corp., 5%; and Marubeni Corp., 5%	Sumitomo Metal Mining Oceania Pty., 13.3%; and SC Mineral Resources Ltd. of Australia, 6.7%	Sumitomo Corp., 0%[2]	Mitsubishi Materials Corp., 31.25%; Dowa Mining Co. Ltd., 6.25%; Furukawa Co. Ltd., 6.25%; and Marubeni Corp., 6.25%.
Majority equity holder and/or other equity holder	Mount Isa Mines Ltd. of Australia, 70%	North Broken Hill Peko Ltd. of Australia, 80%	Imperial Metals Corp. of Canada, 100%[2]	Princeton Mining Corp. of Canada, 50%.
Mineral commodity involved	Lead, silver, and zinc	Copper and gold	Copper and gold	Copper.
Estimated reserves and ore grade	40 million metric tons, 5.5% lead, 12.6% zinc, 55 grams per metric ton silver	63.7 million metric tons, 1.108% copper, 0.487 gram per metric ton gold	81.5 million metric tons, 0.3% copper, 0.42 gram per metric ton gold	56.5 million metric tons, 0.494% copper, 0.014% molybdenum.
Type of mine	Underground	Open pit and underground	Open pit	Open pit.
Total cost of the project	$246 million (Australian)	$303 million (Australian)	$123 million (Canadian)	$136 million (Canadian).
Japanese share	$22 million (Australian)	$75.6 million (Australian)	$109 million (Canadian)	$78 million (Canadian).
Annual production capacity	1,270,000 metric tons of crude ore containing 6.1% lead, 15.4% zinc	3,934,000 metric tons of crude ore containing 1.73% copper plus 0.88 gram per ton gold	6,500,000 metric tons of crude ore	7,145,600 metric tons of crude ore contining 0.502% copper, 0.013% molybdenum.
Annual shipment to Japan	3,284 metric tons of lead and 17,999 metric tons of zinc in mixed concentrate	27,985 metric tons of copper in concentrate	15,000 metric tons of copper in concentrate plus gold value	28,277 metric tons of copper in concentrate.
Construction started	August 1993	May 1993	September 1996	1996.
Production started or planned	September 1995	October 1995	June 1997	October 1997.

	Chile Region III			
	Collahuasi, Region I	La Candelaria, Region III	El Bronce (Atacama Kozan)	Los Pelembres, Region IV
Nature of project involvement	Equity participation and provided loan	Investment in exploration and development	Investment in exploration and development	Equity participation.
Participating Japanese companies and their equity share	Mitsui and Co. Ltd., 6.9%; Mitsui Mining and Smelting Co. Ltd., 1.5%; and Nippon Mining and Metals Co., Ltd., 3.6%	Sumitomo Metal Mining Arizona Inc., 15%; and Sumitomo Corp., 5%	Nittetsu Mining Co. Ltd., 60%	Nippon Mining and Metals Co. Ltd., 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; and Mitsui and Co. Ltd., 1.25%.
Major equity holder and/or other equity holder	Falconbridge Ltd. of Canada, 44%, and Anglo American plc of the United Kingdom, 44%	Phelps Dodge Corp. of the United States, 80%	Inversiones Errazuriz Ltds of Chile, 40%	Antofagasta plc of the United Kingdom, 55.55%, and Anaconda Chile S.A. of Chile, 9.45%.
Mineral commodity involved	Copper	Copper and gold	Copper	Copper.
Estimated reserves and ore grade	1,867.7 million metric tons, 0.93% copper	366 million metric tons, 0.84% copper, 0.205 gram per metric ton gold	20 million metric tons, 1.5% copper, 0.26 gram per metric ton gold	1,139.7 million metric tons, 0.74% copper.
Type of mine	Open pit	Open pit	Underground	Open pit.
Total cost of the project	$1,760 million	$592 million	$110 million	$1,355 million.
Japanese share	$174 million	$296 million	$110 million	$835 million.
Annual production capacity	25,600,000 metric tons of crude ore	10,000,000 metric tons of crude ore	1,650,000 metric tons of crude ore	34,000,000 metric tons of crude ore.
Annual shipment to Japan	94,591 metric tons of copper in concentrate	90,801 metric tons of copper in concentrate	15,000 metric tons of copper in concentrate	167,282 metric tons of copper in concentrate.
Construction started	1996	April 1993	April 2001	November 1997.
Production started or planned	January 1999	March 1995	January 2003	April 2000.

See footnotes at end of table.

TABLE 9--Continued

JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s, AN UPDATE IN 2003

	Indonesia, Batu Hijau, Sumbawa Island	Mexico		Peru, Antamina, Ancash
		Tizapa, Mexico City	Rey de Plata, Guerrero	
Nature of project involvement	Equity participation	Investment in exploration and development	Investment in exploration and development	Investment in exploration and development.
Participating Japanese companies and their equity share	Sumitomo Corp., 26%; Sumitomo Metal Mining Co. Ltd., 5.0%; Mitsubishi Materials Corp., 2.5%; and Furukawa Co. Ltd., 1.5%	Dowa Mining Co. Ltd., 39%; and Sumitomo Corp., 10%	Dowa Mining Co. Ltd., 39%, and Sumitomo Corp., 10%	Mitsubishi Corp., 10%.
Majority equity holder and/or other equity holder	Newmont Gold Co. of the United States, 45%, and P.T. Pukuafu Indah of Indonesia, 20%	Industrias Penoles SA de C.V. of Mexico, 51%	Industrias Penoles SA de C.V. of Mexico, 51%	Noranda Inc. of Canada and Billiton plc of the United Kingdom, 33.75% each; and Teck Cominco Ltd. of Canada, 22.5%.
Mineral commodity involved	Copper and gold	Copper, lead, and zinc	Copper, lead, and zinc	Copper and zinc.
Estimated reserves and ore grade	907.3 million metric tons, 0.44% copper, 0.377 gram per metric ton ton gold	2.5 million metric tons, 0.61% copper, 1.36% lead, 6.56% zinc plus gold and silver	2.9 million metric tons, 0.68% copper, 2.56% lead, 8.78% zinc plus gold and silver	559 million metric tons, 1.23% copper, 1.03% zinc, and 0.03% molybdenum.
Type of mine	Open pit	Underground	Underground	Open pit.
Total cost of the project	$1,925 million	$38.2 million	$45.4 million	$2,296 million.
Japanese share	$513 million	$35.1 million	$41.3 million	$404 million.
Annual production capacity	43,870,000 metric tons of crude ore containing 0.75% copper and 0.44 grams per metric ton gold	480,000 metric tons of crude ore	330,000 metric tons of crude ore	25,600,000 metric tons of crude ore.
Annual shipment to Japan	101,492 metric tons of copper in concentrate	22,151 metric tons of zinc in concentrate	21,985 metric tons of zinc in concentrate	10,579 metric tons of copper in concentrate.
Construction started	September 1996	May 1992	January 1998	1998.
Production started or planned	October 1999	November 1994	October 2000	June 2001.

[1] Mining operations at Mount Polley were suspended in September 2001 owing to continued low copper and gold prices.

[2] SC Minerals Canada Ltd. (a wholly owned subsidiary of Sumitomo Corp.) sold its 47.5% interest in Mount Polley Copper Project to Imperial Metals Corp. of Canada for $4.5 million by the end of 2000.

Sources: Research Institute of Economy, Trade and Industry (Chosakai), Mining Handbook (Kogyo Benran), 2002, p. 210-217; Japan Mining Industry Association, Kozan, v. 56, no. 7, 2003, p. 10-15; Japan Oil, Gas and Metals National Corp., Atakama Kozan Project in Chile, August 2004.

TABLE 10
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	Destinations, 2002	
				United States	Other, principal
METALS					
Alkali and alkaline-earth metals		404	541	19	China 330; India 118; Hong Kong 28.
Aluminum:					
Ore and concentrate		660	400	--	All to Taiwan.
Oxides and hydroxides		278,154 r	295,896	2,815	Republic of Korea 187,292; Taiwan 35,314; Thailand 17,864.
Ash and residue containing aluminum		9,159	8,678	--	China 6,924; Taiwan 713; North Korea 594.
Metal including alloys:					
Scrap		52,674	55,363	72	China 48,498; Hong Kong 4,209; Philippines 1,095.
Unwrought		12,567	12,447	536	Republic of Korea 3,191; Indonesia 3,101; Philippines 1,576.
Antimony:					
Oxides		1,924	2,524	44	Thailand 379; Malaysia 347; Singapore 341.
Metal including alloys, all forms[2]		162	471	2	China 201; Taiwan 100; Spain 76.
Arsenic, metal, including alloys, all forms		29	6	5	Mainly to United Kingdom.
Beryllium, metal, including alloys, all forms		4	2	--	China 1; Taiwan 1.
Bismuth, metal, including alloys, all forms[2]		31	4	--	Malaysia 2. Taiwan 2.
Cadmium, metal including alloys, all forms		57	333	--	China 252; Hong Kong 60.
Chromium:					
Ore and concentrate		65	44	--	Republic of Korea 33; China 5; Indonesia 6.
Oxides and hydroxides		4,494 r	4,706	946	Republic of Korea 2,217; Taiwan 1,020; Indonesia 104.
Metal, including alloys, all forms		226	432	185	Republic of Korea 135; Taiwan 80.
Cobalt:					
Oxides and hydroxides		380	693	3	Republic of Korea 480; Taiwan 78; China 62.
Metal including alloys, all forms		1,342	1,149	137	Hong Kong 309; Canada 304; China 102.
Columbium and tantalum, tantalum metal, including alloys, all forms		348	277	123	United Kingdom 49; Germany 40; China 18.
Copper:					
Ore and concentrate		--	1	--	All to Thailand.
Oxides and hydroxides		1,736	2,223	12	Singapore 1,060; China 605; Republic of Korea 247.
Sulfate		2,922	2,932	45	Hong Kong 304; Republic of Korea 223; Singapore 163.
Metal, including alloys:					
Scrap		156,490	236,672	111	China 224,556; Hong Kong 6,203; Republic of Korea 2,603.
Unwrought		89,386 r	99,454	9,723	Republic of Korea 59,254; China 8,464; Taiwan 8,421.
Semimanufactures, all forms		270,247 r	285,442	18,028	China 45,166; Malaysia 39,678; Republic of Korea 32,086.
Germanium, metal, including alloys, all forms		226 r	503	60	Taiwan 310; China 110; Republic of Korea 17.
Gold:					
Waste and scrap		48	--	63	United Kingdom 200; Sweden 19; Philippines 15.
Metal, including alloys, unwrought and partly wrought		70	69	--	Singapore 21; Malaysia 18; Taiwan 17.
Iron and steel:					
Iron ore and concentrate	thousand tons	60 r	70	--	Mainly to China.
Metal:					
Scrap	do.	6,152 r	6,030	58	China 2,511; Republic of Korea 2,402; Taiwan 923.
Pig iron, cast iron, related materials		532	60,141	2,452	Republic of Korea 23,437; China 19,195; Taiwan 5,506.
Ferroalloys:					
Ferrochromium		2,686	1,362	1,035	Thailand 213; Republic of Korea 33.
Ferromanganese		28,018	14,855	4,395	Taiwan 4,669; Saudi Arabia 1,200; Republic of Korea 1,200.
Ferromolybdenum		21	34	3	Thailand 16; Malaysia 11; Republic of Korea 4.
Ferronickel		121,708	119,507	--	Taiwan 65,589; Republic of Korea 53,918.
Ferrosilicomanganese		431	478	16	Taiwan 270; Republic of Korea 156; Indonesia 36.
Ferrosilicon		4,287	5,592	23	Republic of Korea 2,219; Indonesia 1,111; Thailand 952.
Silicon metal		464	508	10	China 335; Republic of Korea 89; Taiwan 27.
Unspecified		3,449	2,407	1,472	China 209; Thailand 154.
Lead:					
Ore and concentrate		--	1	--	All to China.
Oxides		246	138	--	Taiwan 48; Republic of Korea 31; Singapore 20.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	Destinations, 2002 United States	Other, principal
METALS--Continued					
Lead--Continued					
Ash and residue containing lead		12 r	66	(3)	Thailand 55; China 8; Republic of Korea 2.
Metal, including alloys:					
Scrap		3,857	9,634	--	Republic of Korea 8,946; China 568; India 104.
Unwrought		6,729	23,002	--	China 9,499; Taiwan 3,847; Indonesia 3,418.
Semimanufactures		488	817	119	Taiwan 443; Hong Kong 76; Indonesia 74.
Lithium:					
Oxide and hydroxide		22	35	3	Taiwan 21; China 10.
Magnesium, metal, including alloys:					
Scrap		210	145	--	China 74; United Kingdom 71.
Unwrought		121	240	--	Republic of Korea 211; Taiwan 20.
Manganese:					
Ore and concentrate, battery-grade		2,922	--	--	
Oxides		22,758 r	26,246	2,118	Indonesia 6,441; China 6,011; Singapore 4,372.
Metal, including alloys, all forms		48	29	--	Republic of Korea 10; China 7; Taiwan 4.
Mercury		17	6	--	Indonesia 2; Iran 2.
Molybdenum:					
Ore and concentrate, roasted		--	177	--	Republic of Korea 52; India 17.
Oxides and hydroxides		35	33	2	Netherlands 18; India 5; Italy3.
Metal, including alloys, all forms		172	188	21	Republic of Korea 82; Taiwan 28; Singapore 13.
Nickel:					
Matte and speiss		25,480	23,112	6	Republic of Korea 12,425; Taiwan 10,351. Belgium 328.
Oxides and hydroxides		3,077	4,428	582	Hong Kong 1,621; Taiwan 798; China 720.
Metal, including alloys:					
Scrap		712	308	90	United Kingdom 121; Hong Kong 59; Republic of Korea 14.
Unwrought		954	384	77	United Kingdom 97; Indonesia 57; Republic of Korea 32.
Semimanufactures		8,085	9,551	1455	Hong Kong 1,686; Republic of Korea 1,591; Kazakhstan 1,104.
Platinum-group metals:					
Waste and sweepings		3	--	--	
Metal, including alloys, unwrought and partly wrought:					
Palladium, value	thousands	$1,708 r	$811	$237	Austria $282; Republic of Korea $85; China $78.
Platinum, value	do.	$1,388 r	$882	$67	Hong Kong $460; Singapore $55; Republic of Korea $42.
Rhodium, value	do.	$30 r	$36	$8	Germany $9; Republic of Korea $7; Thailand $6.
Iridium, osmium, ruthenium, value	do.	$26 r	$33	(3)	Malaysia $13; Singapore $12; Germany $2.
Rare-earth metals, including alloys, all forms		197	177	4	China 158; Hong Kong 9; United Kingdom 3.
Selenium		605	572	4	China 236; Hong Kong 109; India 102.
Silicon		3,022	3,732	446	United Kingdom 956; Republic of Korea 622; Malaysia 607.
Silver, metal, including alloys, unwrought and partly wrought, value	thousands	$877 r	$952	$57	Taiwan $299; Republic of Korea $47; Hong Kong $39.
Tin, metals, including alloys:					
Scrap		567	601	18	United Arab Emirates 290; Belgium 231; Taiwan 57.
Unwrought		954	396	--	Malaysia 73; China 62; Taiwan 40.
Semimanufactures		1,705	2,683	90	Hong Kong 719; China 658; Taiwan 292.
Titanium:					
Ore and concentrate		60	24	--	All to Singapore.
Oxides		23,531	25,500	1,565	China 8,985; Taiwan 6,110; Republic of Korea 2,708.
Metal, including alloys, all forms		24,057	18,302	6,600	Taiwan 1,930; United Kingdom 1,921; Sweden 1,401.
Tungsten:					
Ore and concentrate		20	4	--	All to Malaysia.
Metal, including alloys, all forms		2,021	1,826	332	Germany 473; Taiwan 364; China 239.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	Destinations, 2002	
				United States	Other, principal
METALS--Continued					
Uranium and thorium, metals, including alloy, all forms		31	--	--	
Vanadium:					
Oxides and hydroxides		31	248	--	China 139; Netherlands 52; Taiwan 21.
Metal, including alloys, all forms		19	1	--	Mainly to Thailand.
Zinc:					
Ore and concentrate		--	5	--	All to China.
Oxides		2,277	2,345	498	Thailand 355; Turkey 343; China 246.
Blue powder		50	7	(3)	Mainly to Republic of Korea.
Ash and residue containing zinc		1,566	1,661	--	Republic of Korea 1,405; Taiwan 201; Indonesia 38.
Metal including alloys:					
Scrap		5,291	4,514	(3)	China 2,535; Hong Kong 1,033; Taiwan 908.
Unwrought		77,623	107,004	8,512	Taiwan 37,862; Vietnam 14,888; Philippines 12,151.
Semimanufactures		3,605	4,247	101	China 1,372; Indonesia 1,199; Singapore 361.
Zirconium:					
Ore and concentrate		56	302	19	Malaysia 130, China 51; Singapore 42.
Metal, including alloys, all forms		51	44	1	Republic of Korea 14; Canada 13; Taiwan 5.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural, corundum, emery, pumice, etc.		17,462	18,901	27	Republic of Korea 10,824; China 4,523; Taiwan 1,326.
Artificial:					
Corundum		22,054	19,867	3,618	Republic of Korea 4,501; Taiwan 2,737; China 1,748.
Silicon carbide		9,586	9,921	1,021	Taiwan 1,737; Malaysia 978; Thailand 533.
Dust and powder of precious and semiprecious stones, including diamond, value	thousands	$2 [r]	$1	(3)	
Grinding and polishing wheels and stones		9,769	9,279	1,250	Indonesia 1,592; Republic of Korea 944; Mexico 747.
Asbestos, crude		54	29	--	India 18; Hong Kong 10; Malaysia 1.
Barite and witherite		2	2	--	All to Indonesia.
Boron materials, oxides and acids		206	496	--	Taiwan 266; Hong Kong 87; Malaysia 65.
Cement	thousand tons	7,576	8,136	(3)	China 1,931; Hong Kong 1,839; Singapore 1,615.
Chalk		1,251	2,081	--	Republic of Korea 1,476; Taiwan 587; Thailand 18.
Clays, crude:					
Bentonite		1,621	1,801	61	Indonesia 700; China 208; Thailand 425.
Chamotte or dinas earth		96	58	--	Republic of Korea 36; Indonesia 22.
Fire clay		3,033	2,554	--	Taiwan 1,013; Republic of Korea 726; Thailand 447.
Kaolin		5,490	11,182	71	Republic of Korea 6,374; China 1,913; Taiwan 1,481.
Unspecified		20,644	18,484	211	Indonesia 5,479; Taiwan 2,392; China 1,999.
Diamond, natural:					
Gem, not set or strung	carats	223,656 [r]	122,128	858	Singapore 80; Hong Kong 6; Belgium 3.
Industrial stones	thousand carats	2,221	3,299	675	Republic of Korea 1,103; Philippines 603; Germany 296.
Dust and powder	do.	18,078 [r]	10,180	4,601	Republic of Korea 2,101; Thailand 866; Philippines 663.
Diatomite and other infusorial earth		2,496	2,258	--	Taiwan 1,117; Vietnam 440; Netherlands 139.
Feldspar		3,242	4,204	--	Taiwan 3,043; Thailand 817; Hong Kong 259.
Fluorspar		129	578	--	Singapore 440; Thailand 96.
Fertilizer materials:					
Crude, n.e.s.		1,834	5,448	2	China 3,287; Taiwan 907; Republic of Korea 810.
Manufactured:					
Ammonia		3,118	4,217	430	Taiwan 1,845; Singapore 671; Malaysia 580.
Phosphatic		113	7,957	--	Indonesia 5,000; Taiwan 2,870.
Potassic		476	377	248	Republic of Korea 63; Taiwan 38; Indonesia 18.
Unspecified and mixed		892,332	888,526	10,827	Malaysia 285,700; Vietnam 256,358; Philippines 176,973.
Graphite, natural		1,762	1,422	451	Republic of Korea 208; China 145; Germany 129.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	Destinations, 2002 United States	Destinations, 2002 Other, principal
INDUSTRIAL MINERALS--Continued					
Gypsum and plaster		4,548	3,934	27	Republic of Korea 971; Bangladesh 787; Hong Kong 661.
Iodine		5,440	5,350	1,864	France 618; Italy 536; United Kingdom 468.
Kyanite and related materials, mullite and unspecified		2,876	2,929	4	Republic of Korea 2,107; Taiwan 328; China 159.
Lime		4,210	3,979	192	Republic of Korea 1,805; Taiwan 1,029; Malaysia 357.
Magnesium compounds:					
Magnesite, crude		38	51	--	Taiwan 23; Argentina 20; Australia 8.
Oxides and hydroxides		13,806	15,885	5,204	Republic of Korea 1,855; Germany 1,321; Taiwan 1,147.
Mica:					
Crude including splittings and waste		1,133	1,215	249	Thailand 251; Republic of Korea 245; Indonesia 172.
Worked including agglomerated splittings		1,246	1,650	13	China 658; Austria 641; Costa Rica 85.
Nitrates, crude		290	222	--	Thailand 113; Malaysia 15.
Phosphates, crude		--	14	4	All to Malaysia.
Phosphorus, elemental		22	63	4	Taiwan 33; Republic of Korea 22.
Pigments, mineral, iron oxides and hydroxides, processed		37,595	50,390	5,376	Republic of Korea 11,269; China 16,430; Thailand 7,877.
Precious and semiprecious stones other than diamond:					
Natural, value	thousands	$1 r	$3	(3)	Hong Kong $1.
Synthetic, value		$318 r	$325	$77	China $33; Malaysia $19; Thailand $15.
Pyrite, unroasted		25	10	--	All to Republic of Korea.
Quartz crystal, piezoelectric	kilograms	50,421	55,374	1,335	Thailand 16,808; Philippines 15,284; Malaysia 7,689.
Salt and brine		1,250	1,926	42	Republic of Korea 1,136; Thailand 247; Russia 159.
Slag and dross, not metal-bearing	thousand tons	2,851	5,888	286	Taiwan 2,521; Republic of Korea 876; United Arab Emirates 298.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		18,261 r	27,004	10	China 26,513; Taiwan 121; Republic of Korea 85.
Worked, value	thousands	$22 r	$14	$2	China $3; Hong Kong $1; Republic of Korea $1.
Dolomite, chiefly refractory-grade		273	258	29	Taiwan 140; Malaysia 59; Republic of Korea 30.
Gravel and crushed rock		3,853 r	4,371	--	Republic of Korea 3,395; Taiwan 782; Thailand 138.
Limestone other than dimension	thousand tons	2,673	2,003	--	Taiwan 1,174; Australia 563; Republic of Korea 246.
Quartz and quartzite		1,249	2,239	28	Republic of Korea 1,569; United Kingdom 258; Singapore 160.
Sand other than metal-bearing and sand and gravel		9,512	8,119	57	Taiwan 3,205; Indonesia 1,596; China 991.
Sulfur:					
Elemental:					
Crude including native and byproduct	thousand tons	1,218	1,095	59	China 674; Republic of Korea 146; India 107.
Colloidal, precipitated, sublimed		308	949	499	China 133; Republic of Korea 97; Taiwan 70.
Dioxide		12	20	--	Republic of Korea 17; Taiwan 3.
Sulfuric acid	thousand tons	1,248,491 r	1,592,787	27,050	China 768,958; Chile 288,764; Taiwan 152,251.
Talc, steatite, soapstone, pyrophyllite		11,640	6,615	326	Singapore 992; Republic of Korea 905; China 809.
Vermiculite, perlite, chlorite		18,006	23,370	36	Republic of Korea 20,763; Taiwan 2,256; Malaysia 188.

r Revised. -- Zero.

[1] Data presented in this table are from Japan Exports and Imports Commodity by Country, 2001 and 2002. Table prepared by Regina R. Coleman, International Data Unit.

[2] Includes waste and scrap.

[3] Less than 1/2 unit.

TABLE 11
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	Sources, 2002	
				United States	Other, principal
METALS					
Alkali and alkaline-earth metals		288	13,440	3,402	China 8,280; Russia 1,020; France 218.
Aluminum:					
Ore and concentrate		2,050,567 [r]	1,872,834	--	Australia 1,029,115; Indonesia 732,184; India 64,953.
Oxides and hydroxides		88,519	84,920	5,409	Australia 65,286; China 6,894; Germany 3,351.
Ash and residue		1,331	514	--	Russia 233; Republic of Korea 101; China 80.
Metal including alloys:					
Scrap		120,829	133,374	37,004	Australia 13,194; United Kingdom 9,399; Saudi Arabia 7,956.
Unwrought	thousand tons	2,611	2,575	5	Russia 680; New Zealand 197; Brazil 191.
Antimony:					
Ore and concentrate		20	21	--	China 20; Austria 1.
Oxides		7,382	7,112	52	China 6,215; Taiwan 580; Mexico 182.
Metal including alloys, all forms		7,372	6,920	--	China 6,900; Thailand 19.
Arsenic, metal including alloys, all forms		220,621 [r]	226,507	6,347	China 161,015; Norway 14,927; Australia 14,195.
Beryllium, metal including alloys, all forms		13	9	(2)	Mainly from China.
Bismuth, metal including alloys, all forms		241	474	100	China 229; Peru 146; Belgium 76.
Cadmium, metal including alloys, all forms		2,723	3,002	(2)	Republic of Korea 1,185; Canada 503; Peru 286.
Chromium:					
Ore and concentrate		411,120	354,928	--	South Africa 189,132; India 144,120; Iran 10,999.
Oxides and hydroxides		4,970	3,797	353	China 1,622; Kazahkstan 1,240.
Metal including alloys, all forms		3,480	2,922	555	China 1,262; United Kingdom 283; France 514.
Cobalt:					
Ore and concentrate		--	20	--	Australia 10; Netherlands 10.
Oxides and hydroxides		1,484 [r]	2,505	93	Belgium 1,768; Finland 568.
Metal including alloys, all forms		7,973	9,827	152	Canada 2,032; Finland 1,977; Australia 1,781.
Columbium and tantalum, tantalum metal including alloys, all forms		251	132	33	Thailand 38; China 31; Germany 6.
Copper:					
Ore and concentrate	thousand tons	4,112	4,249	--	Chile 1,527; Indonesia 1,015; Papua New Guinea 374.
Matte including cement copper		1,956	1,651	--	Vietnam 708; Taiwan 360; Malaysia 331.
Oxides and hydroxides		3,732	2,787	1,708	Malaysia 474; Vietnam 158; Republic of Korea 140.
Sulfate		741	674	4	Taiwan 240; China 206; Thailand 150.
Ash and residue containing copper		4,020	2,448	343	Malaysia 1,386; Republic of Korea 325; Philippines 150.
Metal including alloys:					
Scrap		142,702	125,709	28,037	Philippines 20,437; Singapore 20,034; Malaysia 13,538.
Unwrought		167,242	127,387	645	Peru 3,494; Indonesia 3,100; Chile 2,994.
Semimanufactures		58,738	60,091	1,944	Republic of Korea 20,224; Malaysia 12,568; Taiwan 5,898.
Germanium, metal including alloys, all forms		7	1	--	Mainly from China.
Gold:					
Waste and sweepings		238	--	--	NA.
Metal including alloys, unwrought and partly wrought	kilograms	43,231	84,706	3,724	Australia 37,913; Switzerland 12,077; Uzbekistan 6,667.
Iron and steel:					
Iron ore and concentrate excluding roasted pyrite	thousand tons	126,297 [r]	129,088	--	Australia 74,280; Brazil 25,019; India 15,504.
Metal:					
Scrap	do.	151,030 [r]	178,623	7,520	Republic of Korea 56,332; Taiwan 42,156; Russia 16,459.
Pig iron, cast iron, related materials	do.	318,772 [r]	267,379	1,099	China 83,103; Brazil 55,335; North Korea 36,558.
Ferroalloys:					
Ferrochromium		739,687	783,371	(2)	South Africa 442,167; Kazahkstan 139,510; China 29,777.
Ferromanganese		54,549	58,053	--	China 32,484; South Africa 17,015; Republic of Korea 4,359.
Ferromolybdenum		3,873	3,993	--	China 3,773; Chile 220.
Ferronickel		45,470	50,058	(2)	New Caledonia 31,925; Indonesia 6,668; Dominica 5,770.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	Sources, 2002	
				United States	Other, principal
METALS--Continued					
Iron and steel--Continued:					
Metal--Continued:					
Ferroalloys--Continued:					
Ferrosilicochromium		3,493	2,812	--	China 2,750; Zimbabwe 62.
Ferrosilicomanganese		218,405	254,269	--	China 200,552; Australia 22,061; Ukraine 15,906.
Ferrosilicon		472,840	463,304	2	Russia 95,044; Brazil 49,550; Ukraine 8,668.
Ferrotungsten		826	546	--	All from China.
Silicon metal		184,771	189,723	120	China 154,287; Norway 14,914; Australia 14,182.
Unspecified		33,787	34,351	10	France 17,407; Brazil 11,780; China 11,329.
Lead:					
Ore and concentrate		186,136	155,109	65,871	Australia 55,400; Peru 13,495; Bolivia 6,496.
Oxides		37,301	26,244	57	China 15,657; Taiwan 6,194; Malaysia 1,160.
Metal including alloys:					
Unwrought		45,208	17,223	2	China 15,261; Peru 797; Mexico 470.
Semimanufactures		2,397	2,293	3	China 1,278; France 687; United Kingdom 160.
Lithium, oxides and hydroxides		1,312	1,019	699	China 228; Russia 57; Taiwan 35.
Magnesium, metal including alloys:					
Scrap		790	1,065	1	Taiwan 836; Republic of Korea 207; China 20.
Unwrought		33,665	35,106	32	China 28,887; Norway 3,218; Canada 2,359.
Semimanufactures		3,350	5,326	212	China 4,780; Russia 207.
Manganese:					
Oxides and dioxides		2,155	2,598	(2)	China 1,583; Belgium 626; South Africa 200.
Metal including alloys, all forms		52,748	45,779	1,077	China 37,033; South Africa 7,400; Costa Rica 180.
Mercury		11	7	(2)	Mainly from Algeria.
Molybdenum:					
Ore and concentrate:					
Roasted		31,687	30,140	1,088	Chile 13,259; Mexico 4,600; Canada 3,990.
Unroasted		60	50	--	Austria 30; China 20.
Oxides and hydroxides		1,492	1,166	267	Chile 513; China 327; Taiwan 18.
Metal including alloys, semimanufactures, all forms		882	630	70	Austria 207; China 203; Uzbekistan 22.
Nickel:					
Ore and concentrate		4,419,916 [r]	4,507,335	--	Mainly from Indonesia.
Matte		117,349	101,450	--	Indonesia 75,267; Australia 26,182.
Oxides and hydroxides		60	106	12	Canada 67; Finland 27.
Metal including alloys:					
Scrap		16,040	14,033	2,553	Russia 3,266; Zimbabwe 2,466; Republic of Korea 1,001.
Unwrought		28,762	41,299	15	Australia 11,234; Russia 8,155; Norway 4,064.
Semimanufactures		11,289	12,123	1,032	Canada 4,769; United Kingdom 4,465; Russia 855.
Platinum-group metals:					
Waste and sweepings		339	--	--	NA.
Metal including alloys, unwrought and partly wrought:					
Palladium, value	thousands	$10,046 [r]	$5,163	$621	Russia $1,311; Germany $412; Netherlands $50.
Platinum	thousand grams	53,031 [r]	53,807	2,888	South Africa 39,733; Germany 3,949; United Kingdom 2209.
Rhodium	do.	4,759 [r]	6,081	615	South Africa 4,588; United Kingdom 396; Hong Kong 54.
Iridium, osmium, ruthenium	do.	6,991 [r]	8,015	570	South Africa 6,507; Germany 396; United Kingdom 270.
Rare-earth metals including alloys, all forms		3,346	4,985	17	China 4,947; Estonia 18; Belgium 2.
Selenium		18	26	--	Philippines 19; Belgium 5; United Kingdom 2.
Silicon, high-purity		6,271	6,052	3,723	Germany 852; United Kingdom 798; China 344.
Silver:					
Ore and concentrate		14,813	10,149	--	Peru 8,156; Chile 1,993.
Metal including alloys, unwrought and partly wrought		1,388 [r]	1,469	342	Mexico 315; Republic of Korea 258; Peru 192.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	Sources, 2002 United States	Sources, 2002 Other, principal
METALS--Continued					
Tin, metal including alloys:					
Ore and concentrate		14	--	--	NA.
Metal including alloys:					
Scrap		36	88	--	Republic of Korea 46; China 23; Thailand 14.
Unwrought		24,144	26,519	17	Indonesia 11,893; China 9,858; Thailand 2,856.
Semimanufactures		369	625	6	Thailand 363; Singapore 189; Republic of Korea 25.
Titanium:					
Ore and concentrate		112,802	385,223	40	Vietnam 116,487; Australia 152,443; India 34,390.
Oxides		14,298	9,106	235	China 5,580; Republic of Korea 2,053; France 601.
Metal including alloys, all forms		10,333	11,074	2,844	Russia 3,910; Kazakhstan 3,420; Ukraine 460.
Tungsten:					
Ore and concentrate		951	887	--	Russia 787; Portugal 80; Netherlands 20.
Metal including alloys, all forms		1,418	1,057	46	China 642; Germany 97; Taiwan 47.
Uranium and thorium, metal including alloys, all forms		767	20	--	All from Vietnam.
Vanadium, metal including alloys, all forms					
Oxides and hydroxides		3,638	3,981	(2)	Australia 1,080; South Africa 1,012.
Ash and residue containing zinc		127	--	--	NA.
Metal including alloys, all forms		230	217	147	Mainly from Germany.
Zinc:					
Ore and concentrate	thousand tons	1,164	1,008	144	Australia 359; Peru 193; Canada 86.
Oxides		13,874	15,680	230	China 6,939; Republic of Korea 5,902; Taiwan 1,332.
Blue powder		1,532	973	(2)	Singapore 473; Republic of Korea 256; China 144.
Ash and residue containing zinc		31,165	19,952	2,575	Taiwan 8,631; Republic of Korea 6,922; Philippines 1,038.
Metal including alloys:					
Scrap		31	45	--	Republic of Korea 29; Philippines 16.
Unwrought		63,580	23,112	(2)	Peru 11,271; China 8,349; Canada 2,412.
Semimanufactures		4,130	5,979	51	China 3,111; Belgium 1,055; Republic of Korea 367.
Zirconium:					
Ore and concentrate		84,124	74,757	1,660	Australia 45,345; South Africa 25,405; Russia 2,170.
Metal including alloys, all forms		557	580	348	France 219; Sweden 2; United Kingdom 2.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural, corundum, emery, pumice, etc.		17,056	22,036	3,180	India 9,864; China 7,037; Republic of Korea 327.
Artificial:					
Corundum		162,405	143,877	432	China 126,168; Austria 5,219; Australia 5,032.
Silicon carbide		68,519	57,831	34	China 53,055; Brazil 2,165; Norway 951.
Dust and powder of precious and semiprecious stones including diamonds, value	thousands	$9 [r]	$21	$18	Mainly from China.
Grinding and polishing wheels and stones		5,200	5,563	155	China 3,293; Thailand 1,373; Taiwan 134.
Asbestos, crude		79,463	43,390	2,154	Canada 24,430; Zimbabwe 11,265; Brazil 2,974.
Barite and witherite		94,272	79,959	310	China 75,176; North Korea 4,297; Thailand 176.
Boron:					
Crude natural borates		44,679	34,480	20	Turkey 29,930; Russia 4,530.
Oxides and acids		555	427	391	Russia 36.
Cement		1,183,529 [r]	824,029	222	Republic of Korea 798,802; France 12,393; China 10,981.
Clays, crude:					
Bentonite		200,022	208,798	133,901	China 37,937; Canada 35,218; New Zealand 786.
Chamotte or dinas earth		15,388	6,892	--	China 3,011; South Africa 1,944; Republic of Korea 1,749.
Fire clay		9,989	5,786	1,720	China 4,064; Brazil 2.
Fuller's earth		9,140	10,075	6,293	China 3,348; Australia 434.
Kaolin		1,381 [r]	1,286	895	Brazil 231; Indonesia 55; China 53.
Unspecified		152,695	159,855	2,363	China 156,024; Czech Republic 601.
Cryolite and chiolite		53	--	--	NA.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	Sources, 2002	
				United States	Other, principal
INDUSTRIAL MINERALS--Continued					
Diamond, natural:					
Gem, not set or strung	carats	31,651 [r]	22,750	4,610	United Kingdom 7,447; Israel 4,734; Belgium 2,412.
Industrial stones	thousand carats	1,534	3,344	118	Ireland 3,121; United Kingdom 36; Belgium 34.
Dust and powder	do.	92,436	99,575	17,455	Ireland 31,739; Ukraine 4,660; Republic of Korea 4,438.
Diatomite and other infusorial earth		7,427	6,889	5,117	China 1,730; Netherlands 23; Germany 10.
Feldspar		1,366	2,049	--	Malaysia 916; India 636; China 477.
Fluorspar		519,221	397,039	--	China 358,864; Mexico 23,131; Thailand 7,000.
Fertilizer materials:					
Crude, n.e.s.		57,635	33,712	6	China 14,474; Indonesia 13,758; Canada 473.
Manufactured:					
Ammonia		20,505	85,886	1,230	Taiwan 57,456; Singapore 27,200.
Phosphatic		139,713	161,697	47,868	China 102,025; Republic of Korea 9,199; Israel 2,500.
Potassic		930,053 [r]	952,986	292,544	Canada 334,732; Russia 98,281; Germany 64,677.
Unspecified and mixed		1,999,129 [r]	2,153,422	768,372	Canada 334,732; Jordan 263,979; China 149,396.
Graphite, natural		143,540	105,074	266	China 101,098; Sri Lanka 1,657.
Gypsum and plaster		1,983,225	1,922,296	405	Australia 940,118; Thailand 734,760; Mexico 242,535.
Iodine		273	375	1	Mainly from Chile.
Lime		17,675	9,861	--	Thailand 8,000; China 1,799.
Magnesium compounds:					
Magnesite, crude		1,870	2,524	--	North Korea 1,378; China 1,026.
Oxides and hydroxides		26,689	17,956	209	China 9,264; Israel 4,426; Republic of Korea 1,722.
Other		476	636	--	All from China.
Mica:					
Crude including splittings and waste		47,902	47,488	340	China 32,343; India 6,028; Canada 2,844.
Worked including agglomerated splittings		236	186	8	Belgium 78; China 31; Switzerland 22.
Nitrates, crude		22,024	11,368	--	Chile 11,200; China 100.
Phosphates, crude		770,645 [r]	844,527	21,854	China 365,348; South Africa 222,248; Morocco 102,877.
Phosphorus		26,541	28,213	38	China 27,610; Netherlands 498; Germany 62.
Pigments, mineral:					
Natural crude		252	--	--	NA.
Iron oxides and hydroxides, processed		54,460	21,842	1,840	China 11,311; Germany 5,512; Republic of Korea 1,779.
Potassium salts		72	--	--	NA.
Precious and semiprecious stones, other than diamond:					
Natural		672	1,148	14	Brazil 581; China 295; South Africa 162.
Synthetic	kilograms	50,706	40,138	10,724	China 13,746; Austria 5,645; Republic of Korea 3,522.
Pyrite, unroasted		9,773	7,109	--	Mainly from China.
Quartz crystal, piezoelectric	kilograms	150,588	62,206	14,259	Brazil 20,000; Malaysia 9,725; China 8,325.
Salt and brine	thousand tons	7,866	7,428	2	Mexico 3,637; Australia 3,102; India 392.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	do.	268	161	1	China 35; India 24; South Africa 20.
Worked	do.	1,542	1,583	3	China 1,437; Italy 41; Spain 15.
Dolomite, chiefly refractory-grade		273	258	29	Taiwan 140; Malaysia 59.
Gravel and crushed rock		11,044 [r]	16,703	3,532	Guam 4,701; Republic of Korea 3,411; Taiwan 889.
Limestone other than dimension	thousand tons	2,673	2,003	--	Taiwan 1,174; Australia 563; Republic of Korea 246.
Quartz and quartzite		108,538	122,503	2,797	Republic of Korea 50,977; India 39,066; China 21,357.
Sand other than metal-bearing and sand and gravel	thousand tons	7,273	6,028	2	China 4,131; Australia 1,410; Taiwan 290.
Sulfur:					
Elemental:					
Crude including native and byproduct		488	888	--	China 568; Republic of Korea 320.
Colloidal, precipitated, sublimed		1,198	1,245	--	Republic of Korea 1,178; France 62.
Sulfuric acid		2	8,316	1	Republic of Korea 8,314; Taiwan 1.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2001	2002	Sources, 2002	
			United States	Other, principal
INDUSTRIAL MINERALS--Continued				
Talc, steatite, soapstone, pyrophyllite	362,623	322,592	2,676	China 270,134; Australia 46,310.
Vermiculite, perlite, chlorite	193,303	192,013	729	China 175,072; South Africa 13,330.
Other, slag and dross, not metal-bearing	778,149	706,802	34,690	Republic of Korea 210,794; Taiwan 185,753.

NA Not Available. [r]Revised. -- Zero.

[1] Data presented in this table are from Japan Exports and Imports Commodity by Country, 2001 and 2002. Table prepared by Regina R. Coleman, International Data Unit.

[2] Less than 1/2 unit.

THE MINERAL INDUSTRY OF NORTH KOREA

By Pui-Kwan Tse

North Korea (the Democratic People's Republic of Korea) borders the eastern Chinese Provinces of Jilin and Liaoning and the Republic of Korea. During the past couple of years, North Korea emerged from its state of isolation by opening up its industrial sectors to foreign investment. On July 1, 2002, the Government introduced an economic reform program that would phase out the Government's food-rationing system; establish free markets in major cities; designate Gaesong, Mount Genumgang, and Shinuiju as special economic zones; and send groups abroad to learn about market economies. The Government also planned to reorganize several administrative areas, or "Teukgeupsi," to attract foreign investors. The Government intended to designate Nampo and Wonsan as additional processing trade zones in 2004, which would allow foreign investors to establish facilities in these zones. The Nampo area was one of several well-developed industrial areas in North Korea; it is one of the inter-Korean connection points and had the potential to be a commercial base in Northeast Asia. Nampo Port, which was the largest port in North Korea, accounted for 28.9% of the country's total trade; it had a loading and unloading capacity of 7.5 million metric tons (Mt) and a berthing capacity of 25,000 metric tons (t) (Ministry of Unification, 2004a§[1]).

North Korea is rich in mineral deposits of copper, gold, graphite, iron, lead, magnesite, tungsten, and zinc. With the end of the Cold War, North Korea had lost a large amount of aid from China and the former Soviet Union and faced shortages of electricity, food, and raw materials. Much of the equipment in use was in need of spare parts, and owing to a lack of electricity, many machines were either operated manually or shut down. As a result, minerals production declined sharply. During the past several years, the Government allowed foreign investors to participate in selected projects. Factory-worker productivity improved, and exports to China and Southeast Asia increased. The Government planned to continue its effort to consolidate heavy industries and develop light industries (Washington Post, The, 2004).

In 2003, the economy of North Korea continued to grow steadily for the fifth consecutive year. This growth was reflected in the gross domestic product, which increased by 1.8%. All sectors recorded an increase of growth. Power, mining, and construction grew by 4.2%, 3.2%, and 2.1%, respectively. In 2003, trade totaled $2.39 billion; of that amount, $1.61 billion was for imports and $780 million was for exports. China remained North Korea's leading trading partner at a value of $1.02 billion. The reported value of inter-Korean trade, which was excluded from the reported figure for total trade, grew by 12.9% to $724 million. Owing to expanded food loans and humanitarian aid, exports to North Korea from the Republic of Korea increased by 17.5% to $435 million; of these exports, chemical and agricultural products were the major commodities. The Government planned to achieve economic growth by expanding trade and cooperation with international organizations and by increasing spending on science and technology by 60% in 2004 (Bank of Korea, 2004; Ministry of Unification, 2004b§).

North Korea has significant resources of iron ore, which are located at Chaeyong, Hason, Komdok, Musan, Sehaeri, Songhung, Tokhyon, Tokonsong, Toksong, and Unryul. The leading iron ore mine was at Musan and had a designed output capacity of 10 million metric tons per year (Mt/yr) of ore and concentrates. These materials were transported via pipeline to the Kim Chaek steel plant, which had an output capacity of 4 Mt/yr. Owing to a lack of funds to modernize the Kim Chaek Mine, processing plant, and steel plant, all operated below their output capacities.

The three magnesite mines (Dae Hung, Paek Bai, and Ryong Yang) had a total output capacity of 2.5 Mt/yr. The opencast Dae Hung Mine is located from 1,030 to 1,530 meters above sea level in a mountainous region at the northern part of South Hamgyong Province. The mine, which was developed in 1978, had a design capacity of 1.3 Mt/yr of ore. An underground mine, Ryong Yang, is located at the southern part of the Dae Hung Mine in the South Hamgyong Province; it had an output capacity of 1 Mt/yr. Another underground mine, Paek Bai, is located at the coastal area of Yanggang Province; it had an output capacity of 200,000 metric tons per year (t/yr). Ores were transported via railway and road to plants at Dae Hung, Song Jin, and Tanchon. The processed ore, which had a magnesium oxide content of about 46%, was exported to China. The Dae Hung Mine also produced chlorite and talc (Muk and others, 2003).

Two state-owned companies, Korea Resources Corp. (KRC) of the Republic of Korea and Samchelli Corp. of North Korea, planned to form a joint venture to mine graphite at Yongho, North Korea. KRC will provide equipment and machinery to develop the mine and will export about 10,000 t/yr of graphite to the Republic of Korea (Mining Journal, 2003).

Monazite was produced through International Chemical Joint Venture Corp., which was a joint venture between state-owned Korea Ryongaksan General Trading Co. and a Japanese company. The mine is located at Chelsan near the Chinese border and had estimated resources of 500,000 t. The company operated a processing plant that had a design capacity of 1,500 t/yr (Mining Journal, 2003).

In 2002, the total power-generation capacity of North Korea was 7,770 megawatts; 70% of the power-generating facilities, however, was either abandoned or required parts to repair. In 2002, the total amount of power generated was 19.0 billion kilowatthours. Of North Korea's 24,449 kilometers (km) of roads, only 12% was paved; a majority of the roads had fewer than two lanes. The public railway system consisted of

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[1] References that include a section mark (§) are found in the Internet References Cited section.

5,235 km of track, of which 80% was electrified. Owing to power shortages, railway operation was suspended frequently. North Korea's ports had a total loading and unloading capacity of 35.5 Mt (Ministry of Unification, 2003§).

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TABLE 1

NORTH KOREA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES [1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		1999	2000	2001	2002	2003
METALS						
Cadmium metal, smelter		100	100	100	100	100
Copper:						
Mine output, Cu content		14,000	13,000	13,000	13,000	13,000
Metal:						
Smelter, primary and secondary		15,000	13,000	13,000	13,000	13,000
Refinery, primary and secondary		16,000	14,000	14,000	14,000	14,000
Gold, mine output, Au content	kilograms	2,500	2,000	2,000	2,000	2,000
Iron and steel:						
Iron ore and concentrate, marketable:						
Gross weight	thousand tons	3,800	3,800	4,200	4,100	4,430
Fe content	do.	1,100	1,100	1,200	1,150	1,260
Metal:						
Pig iron	do.	800	800	800	800	900
Ferroalloys, unspecified	do.	10	10	10	10	10
Steel, crude	do.	1,000	1,000	1,000	1,030 [r]	1,090
Lead:						
Mine output, Pb content		60,000	60,000	60,000	60,000	60,000
Metal:						
Smelter, primary and secondary		60,000	60,000	60,000	60,000	60,000
Refinery, primary and secondary		75,000	75,000	75,000	75,000	75,000
Silver, mine output, Ag content		40	40	40	40	40
Tungsten, mine output, W content		500	500	500	600	600
Zinc:						
Mine output, Zn content		100,000	100,000	100,000	100,000	100,000
Metal, primary and secondary		100,000	100,000	100,000	100,000	100,000
INDUSTRIAL MINERALS						
Barite		70,000	70,000	70,000	70,000	70,000
Cement, hydraulic	thousand tons	4,000	4,600	5,160	5,320	5,540
Fluorspar		25,000	25,000	25,000	25,000	25,000
Graphite		33,000	30,000	25,000	25,000	25,000
Magnesite, crude	thousand tons	1,000	1,000	1,000	1,000	1,000
Nitrogen, N content of ammonia	do.	100	100	100	100	100
Phosphate rock		350,000	350,000	350,000	300,000	300,000
Salt, all types		500,000	500,000	500,000	500,000	500,000
Sulfur	thousand tons	41	41	41	42	42
Talc, soapstone, pyrophyllite		120,000	120,000	120,000	110,000	110,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand tons	15,000	16,000	16,000	17,000	16,000
Lignite	do.	5,500	6,500	7,000	7,000	6,300
Total	do.	20,500	22,500	23,000	24,000	22,300
Coke	do.	2,000	2,000	2,000	2,000	2,000

[r] Revised.

[1] Table includes data available through July 25, 2004.

[2] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[3] In addition to the commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, and petroleum products presumably are produced, but available information is inadequate to make reliable estimates of output levels.

THE MINERAL INDUSTRY OF THE REPUBLIC OF KOREA

By Pui-Kwan Tse

Although the Republic of Korea's economy continued to grow in 2003, the growth rate was slower than that of 2002; the economic growth rate was 3.1%, which was less than one-half that of 2002 (Bank of Korea, 2004b). The gross domestic product (GDP) increased to $605 billion, and per capita income rose to $12,646. The manufacturing and mining sectors accounted for 22.1% and 0.5% of the GDP, respectively. Because of the increase in household debt, domestic consumption decreased sharply. Durable goods shipments contracted by 17%, and nondurable consumer goods shipments also declined by 5.5%. About 8% of the population was delinquent on credit card payments, which forced credit companies to cut credit lines; domestic analysts estimated that the delinquent rate was as high as 30% (Far Eastern Economic Review, 2004). The growth of the GDP was attributed to the increase in foreign trade. Net exports increased by about 90% and accounted for 2.8% of the growth rate. Because of the economic slowdown and rigidities in the labor market, the unemployment rate increased to 3.5% in December. Domestic demand gradually recovered at yearend. Exports of automobiles, electronics, and steel continued to maintain their growth as the global economy recovered. The Republic of Korea's economic growth was expected to increase in 2004 (Ministry of Finance and Economy, 2004, p. 3-14; Korea National Statistical Office, 2004§[1]).

Throughout the year, the Government continued to push financial reform and sold off some state-owned financial institutions. The Government revised and enacted financial legislation to strengthen protection for consumers and investors. The revision of the Bank Act, the Specialized Credit Financial Business Act, and the Enforcement Decree were introduced. The ailing insurance companies, mutual savings banks, and credit unions were rehabilitated through sales and mergers. Corporate restructuring had made significant progress, but one-quarter of the corporations was increasingly unprofitable and highly leveraged. A draft Consolidated Insolvency Law was submitted to the National Assembly for approval to give Koreans an appropriate legal basis to close corporations. The Government established the Korea Housing Finance Corporation to deal with the household debt issues. The Corporation would provide mortgages to people in need and help refinance short-term mortgage loans, thus reducing the risk of loan default. In 2004, the Government planned to reduce the special excise tax, which had been introduced in 1997 to levy more taxes on luxury items and services. The tax cut was designed to stimulate domestic consumption. In 2003, the Government, employers, and workers reached an agreement to improve the labor situation in the Republic of Korea. Under the terms of the agreement, labor unions will cooperate to stabilize general wage levels and to reduce confrontations between management and workers. Companies will increase investment and create new jobs. The Government continued its efforts to turn the country into the business hub of Northeast Asia. Two free economic zones, Busan/Jinhae and Gwangyang Bay, were designated in 2003 (Ministry of Finance and Economy, 2003; Bank of Korea, 2004a).

Because the Republic of Korea has limited mineral resources, it imports a variety of minerals to meet its increasing demand. Nearly 100% of the country's demand for such minerals as bituminous coal; copper, iron, lead, and zinc ores; fluorite; gypsum; magnesite; and phosphate were imported from other countries. Korea Resources Corp. (KRC), which is a ministry-controlled company, planned to invest $2.16 million to conduct feasibility studies on nine exploration sites in Australia, China, Indonesia, and Kazakhstan. KRC focused on such import-dependent minerals as coal, copper, lead/zinc, rare earths, and uranium (Korea Metal Journal, 2003b§).

The competition between China and the Republic of Korea over exports of ferrous and nonferrous metals and products has become more intense. China had increased its market shares of exports to the international market in the past several years. Because of huge investments and technology transfers from Japan and western countries, China had rapidly narrowed the gap with the Republic of Korea on production technologies. The Government urged metal producers to upgrade their production lines to produce high-value-added products to survive. These companies are expected to face increased competition from high-quality Japanese products and low-cost Chinese products in the international market (Korea Metal Journal, 2003a§).

In 2003, the Republic of Korea's trade totaled $372.6 billion. Exports rose by 19.3% to $193.8 billion, and imports increased by 17.8% to $178.8 billion. The United States was the Republic of Korea's largest trading partner followed by China, Japan, and Taiwan. China replaced the United States as the Republic of Korea's largest export market (Korea International Trade Association, 2004a§). Petroleum and raw materials accounted for about 55.4% of total imports, and metal products shared about 1% of total exports.

Effective on July 1, 2003, the import tariff rates on raw materials, which included coal and copper, iron, lead, manganese, titanium, and zinc ores, and aluminum ingot, copper, nickel oxide, and pig iron were reduced. The normal import tariff rate on raw materials was 13%. The special tariff rate ranged from 0% to 3%. The industry urged the Government to apply a zero tariff on all imported raw materials that were noncompetitive to domestic producers to strengthen global competitiveness. The Government planned to submit an amendment to the National Assembly for approval to reduce the tariff rate to zero on raw materials for ferrous and nonferrous metal production at yearend (Korea Metal Journal, 2003d§).

In 2003, demand for downstream aluminum products, such as foil, extrusion, and sheet, was strong. The Republic of Korea relied entirely on imported aluminum ingot to meet the demands of downstream producers. Imports of aluminum ingot increased by 7.5% to 844,072 metric tons (t). Aluminum ingot from China accounted for 40% of total imports followed by Australia (21%) and Russia (20%). Shares of aluminum products from China increased to 31.1% in 2002 compared with 27.5% in 2001 and 23.6% in 2000. During the same period, exports of aluminum products, which were mainly foils and sheet, to China also increased. Sales by Alcan Taihan Aluminum Co., Choil Aluminum Co., Namsum Aluminum Co., and Seoul Light Steel Co., which were major aluminum sheet producers, increased by a total of 13.6% in 2003 compared with those of 2002. Domestic sales of aluminum foil decreased by 5.4%, and exports increased by 12.7%, which resulted in a total sales increase of aluminum foil of only 0.4%. The high growth of aluminum foil and sheet exports was mainly attributed to the increased demand from China. The Republic of Korea's aluminum producers planned to expand their output capacities to meet China's demand (Korea Metal Journal, 2004a§, c§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

The Republic of Korea's copper market was quite active in 2003. With limited domestic copper resources, the country depended on import concentrates to meet its demand. In 2003, a total of 1.3 million metric tons (Mt) copper concentrates was imported from, in descending order, Chile, Indonesia, Argentina, Switzerland, Peru, and Guinea; Chile, which accounted for 31.4% of total concentrate imports, replaced Indonesia to become the major supplier. In 2003, domestic refined copper production increased slightly. Owing to the rising price of copper in the international market, especially in the second half of the year, refined copper imports decreased by 2% to 411,245 t; Chile was the major supplier. Refined copper exports increased by 171.1% to 39,765 t; China was the main destination. Because of increased domestic demand, the volume of unwrought copper exports declined in the last quarter. Owing to rising prices in the international market, the volume of copper scrap imports also decreased by 22% to 153,163 t, and the volume of exports increased by 176% to 94,054 t. Copper scrap was imported mainly from the United States and South Africa and was exported mainly to China. Domestic copper alloy producers had difficulty in securing high-grade copper scrap for their smelters. Copper alloy producers urged the Government to restrict the export of copper scrap; a large portion of copper scrap shipped to China, however, was the coated cable wire that was not recycled in the Republic of Korea. In 2003, the country consumed about 915,000 t of copper (Korea Metal Journal, 2003e§, 2004d§; Korea International Trade Association, 2004b§).

During the past several years, copper alloy producers have continuously expanded their output capacities despite domestic demand being slower than expected. Copper alloy producers from China and Japan had found ways to penetrate Korea's market. Imports of copper alloy from China and Japan had increased sharply in 2003. The competition in terms of price between domestic and import products was severe. Owing to the shortage of raw materials, high production costs, and sluggish demand, small copper alloy producers were forced to suspend production in 2003 (Korea Metal Journal, 2004d§).

Asia Gold Corp. of Canada decided to sell its 90% interest in its Korean activities to Hangum Co. Ltd. of Korea. The sale included Asia Gold's share of the Silver Hill (Eunsan) gold and silver mine. It received $422,000 in cash and the sale of concentrate produced from the Silver Hill Mine until March 31, 2004. Asia Gold planned to devote more company resources to exploration projects in China and Mongolia (Asia Gold Corp., 2004).

According to the Korea Iron and Steel Association, crude steel production in the Republic of Korea has grown each year for the past 5 years and was the fifth ranked crude-steel-producing country in the world following China, Japan, the United States, and Russia. The output of carbon steel from electric-arc furnaces (EAFs) increased by 1.1%, and the output from converters increased by 2.7% because Pohang Iron and Steel Co. Ltd. (POSCO) completed the renovation of its No. 1 blast furnace in Gwangyang. Because of increased demand in the automobile, home appliance, and shipbuilding sectors, the consumption of steel increased by 4.8%. In 2003, the Republic of Korea produced more than 3.86 million automobiles and exported more than 2.56 million. Domestic automobile sales decreased by 19%. In the shipbuilding sector, the Republic of Korea increased its global market share to 43.5% in 2003 compared with 29.6% in 2002 and overtook Japan to become the leading shipbuilding country in the world. Because the shipment of steel products to China increased by 38.8% in 2003, the export of steel products increased by 9.5% to 15.1 Mt compared with that of 2002. Imports of steel increased by 10.4% to 15.6 Mt. The steel trade deficit resulted mainly from a substantial increase in imports of iron scrap and other raw materials used to produce steel products. The Republic of Korea depended heavily on the importation of iron scrap to meet domestic EAF demands. Crude steel from EAFs accounted for about 45% of the country's total output (Korea Metal Journal, 2004b§, f§, g§, j§).

During the next 5 years, POSCO planned to invest a total of $11.3 billion to expand production capacity and to develop value-added products and FINEX (a next generation of ironmaking processing technology). The FINEX process was expected to save 15% of production costs compared with the blast furnace process. A FINEX pilot plant was inaugurated in early 2003, was scheduled to reach commercial production by 2005, and would replace small- and mid-sized blast furnaces. About 79% of the investment funds will be from the domestic steel sector, 16% from the overseas steel subsidiaries, and 5% from nonsteel sectors. The company intended to increase domestic crude steel output capacity to 32 Mt by applying the new steel technology developed by its research institute. POSCO planned to add a new steelmaking plant in China, India, or one of the Southeast Asia countries. The reason for adding a steelmaking plant in one of these countries was to ease the constraint on upstream products for its subsidiaries. POSCO had four joint ventures in China and one in Vietnam (Metal Bulletin, 2004; Korea Metal Journal, 2003c§).

In 2003, POSCO completed the construction of its No. 3 stainless steel plant. The total investment was $417 million, and major equipment was imported from SMS-Demag AG of Germany and Voest-Alpine AG of Austria. The company had a total stainless steel output capacity of 1.66 Mt from its three plants. POSCO also started the construction of its Nos. 5 and

6 continuous galvanizing lines in Pohang and Gwangyang, respectively. These two lines were scheduled to be completed in early 2006 and would add a total of 850,000 t in output capacity. At that time, the company would have a total galvanized sheet output capacity of 2 Mt (Korea Metal Journal, 2004h§).

INI Steel Co. announced that the company planned to invest $117 million to build an 800,000-metric-ton-per-year (t/yr) H-beam plant in Dalian, China. INI estimated that H-beam demand in China would reach 10 Mt in 2010. According to the company's schedule, construction was to begin in May 2004, and the plant was to be put into operation in October 2005. The company also planned to expand output capacity to 1 million metric tons per year (Mt/yr) by 2008. INI will be the first steel company from the Republic of Korea to build a steel section plant in China (Korea Metal Journal, 2004e§).

The rising demand for nickel in the stainless steel sector forced the country to import more refined nickel. In 2003, nickel demand was estimated to be 100,000 t and was expected to increase by 9% in 2004. POSCO accounted for about 90% of the country's nickel consumption. Korea Nickel Corp. was a joint venture among Korea Zinc Co. Ltd., POSCO Steel Services and Sales Co. Ltd. (Posteel) (POSCO's trading company), and Inco Limited of Canada. Korea Zinc held 56% of shares; Inco, 25%; and Posteel, 19%. Korea Nickel had two electric furnaces with design output capacities of 32,000 t/yr and 16,500 t/yr. The company operated only the 32,000-t/yr furnace and used the 16,500-t/yr furnace as a stand-by unit because of the shortage of raw material supplies. Korea Nickel imported all its nickel oxide from Inco and sold its refined nickel domestically. Australia, Canada, and Russia were major refined nickel suppliers (Korea Zinc Co. Ltd., 2003, p. 32).

In 2003, the Republic of Korea consumed about 530,000 t of refined zinc, and the country's two zinc producers, Korea Zinc and its parent, Young Poong Corp., supplied less than 50% of the total consumption. Refined zinc imports were mainly from Australia where Korea Zinc's subsidiary Townsville, Queensland, zinc refinery was located. The Republic of Korea also imported zinc metal from North Korea, but the shipment was recorded as internal and was not reported in trade statistics. The Republic of Korea's zinc producers planned to raise their combined output by 5.7% in 2004 (Korea Metal Journal, 2004i§).

The Korean cement sector began to recover. In 2003, the country's cement output exceeded the 1997 level of 59.7 Mt. The cement consumption, however, remained below the 1997 level—58.3 Mt in 2003 compared with 61.7 Mt in 1997 (Korea Cement Industrial Association, 2004§). The Lafarge Group announced that it had acquired an additional 10.2% of its shares from State of Wisconsin Investment to become the majority shareholder (50.1%) of Lafarge Halla Cement Corp. During the same period, Lafarge sold all its shares in Tong Yang Cement Co. Ltd. to the Tong Yang Major Corp. for $138 million. Tong Yang Cement was a joint venture between Lafarge and Tong Yang Major in 2001 (Lafarge Group, 2003).

Coal supplied about 20% of the total energy requirements. Most steam coal was imported, mainly from Australia and China, because the country produced low-quality anthracite, which was used for home heating and small boilers. Because of depleted resources and high production costs, coal production declined steadily during the past several years. The Government planned to close several coal mines in 2005. In 2003, the Republic of Korea imported 65.3 Mt of bituminous coal; China and Australia accounted for 40.6% and 38.7%, respectively, of the total imports (Korea International Trade Association, 2004c§).

The country relied on imported crude oil and natural gas to meet its fossil fuel demand. Hydrocarbons accounted for about 54% of total energy consumption in Korea. In November, state-owned Korea National Oil Corp.'s (KNOC) $320 million Donghae-1 project began producing a small amount of natural gas. Donghae-1 gasfield, which is located 60 km off Ulsan in the Ulleung Basin, has about 200 billion cubic meters of gas. As part of inter-Korean economic cooperation, KNOC intended to take part in North Korea's oil exploration project, which is located offshore of the west coast (Asian Times, 2004§).

In 2003, POSCO and SK Power Co. Ltd. selected BP Indonesia to supply up to 1.35 Mt/yr of liquefied natural gas (LNG) from the Tangguh gasfield in Indonesia for 20 years starting in 2005. This had been the first LNG bidding process undertaken by private companies in the Republic of Korea. State-owned Korea Gas Co. held the exclusive rights to import LNG. POSCO was building an LNG-receiving terminal at Gwangyang and had two gas-fired powerplants, which were located in Gwangyang and Pohang; they had a total generating capacity of 845 megawatts (MW). SK Power will construct a 1,080-MW powerplant at Gwangyang (British Petroleum Co., 2003).

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TABLE 1
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES [1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003
METALS						
Bismuth, metal		108	71	106	69	116 [e]
Cadmium, smelter		1,791	1,911	1,879	1,827	2,175
Copper:						
Smelter[e]		370,000	410,000	410,000	410,000	460,000
Refined, primary and secondary		450,444	467,900	473,624	494,561	509,970
Gold, metal	kilograms	25,730	22,605	28,595	26,181	40,262
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	410	336	195	365 [r]	365
Fe content	do.	230	188	109	164 [r]	161
Metal:						
Pig iron	do.	23,329	24,938	25,898	26,570	27,314
Ferroalloys:						
Ferromanganese		140,208	146,373	143,525	137,000	141,000
Ferrosilicomanganese		116,091	103,522	101,877	94,000	--
Other		4,639	4,676	4,452	--	--
Total		260,938	254,571	249,854	231,000	141,000
Steel, crude	thousand tons	41,042	43,107	43,852	45,390	46,310
Lead:						
Mine output, Pb content		1,822	2,724	988	28	--
Metal, smelter		143,583	170,704	161,000	178,722	169,297
Nickel		20,235	29,890	26,429	30,337	31,000 [e]
Silver, metal	kilograms	488,792	591,130	664,533	973,140	947,781
Zinc:						
Mine output, Zn content		9,832	11,474	5,129	99	--
Metal, primary		429,766	473,897	503,315	600,027	644,218
INDUSTRIAL MINERALS						
Barite		--	30	--	--	--
Cement, hydraulic	thousand tons	48,579	51,424	52,046	55,514	59,199
Clays, kaolin	do.	1,858	2,098	2,384	2,831	2,500 [e]
Diatomaceous earth		30,222	34,143	27,530	20,666	15,636
Feldspar		409,334	330,417	389,361	415,580	477,012
Graphite, all types		62	65	65	94	58
Mica, all grades		24,733	65,249	109,339	29,870	33,645
Nitrogen, N content of ammonia		489,000	369,000	368,000	153,000	154,641
Salt[e]		750,000	800,000	800,000	800,000	800,000
Soda ash, manufactured[e]		310,000	310,000	310,000	310,000	310,000
Stone, sand and gravel:						
Limestone	thousand tons	74,061	77,868	79,521	83,767	88,525
Quartzite	do.	2,160	2,321	2,377	3,041	2,966
Sand, including glass sand	do.	1,306	879	900	891	480
Sulfur, byproduct:[e]						
Metallurgy	do.	528	572	665	680	690
Petroleum	do.	600	600	600	610	610
Total	do.	1,130	1,170	1,270	1,290	1,300
Talc and related materials:						
Pyrophyllite		754,657	917,973	1,101,825	889,961	912,285
Talc		15,313	11,344	47,712	37,863	47,911
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		438,128	454,699	438,128	459,985 [r]	464,941
Coal, anthracite	thousand tons	4,197	4,174	3,817	3,318	3,298
Fuel briquets, anthracite briquets[e]		13,000	13,000	13,000	13,000	13,000
Petroleum refinery products	thousand 42-gallon barrels	897,373	911,761	930,000 [e]	940,000 [e]	950,000 [e]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to total shown. [r] Revised. -- Zero.

[1] Table includes data available through June 1, 2004.

TABLE 2
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bismuth, metal	metric tons	Korea Zinc Co. Ltd.	Onsan	100
Cadmium	do.	do.	do.	2,000
Cement		Ssangyong Cement Industrial Co. Ltd.	Plants at Chandong, Kwang Yang, Mungyong, Pukpyong, and Yongwol	17,900
Do.		Sung Shin Cement Manufacturing Co. Ltd.	Tanyang plant	13,700
Do.		Tong Yang Major Corp.	Plants at Pukpyong and Samchok	12,600
Do.		Lafarge Halla Cement Corp.	Plants at Kwang Yang and Okkye	9,500
Do.		Hyundai Cement Co. Ltd.	Plants at Tanyang and Yongwol	8,600
Do.		Hanil Cement Manufacturing Co.	Plants at Chungbuk and Tanyang	7,900
Do.		Asia Cement Manufacturing Co. Ltd.	Plants at Daegu and Jaechon	4,600
Coal		Korea Coal Corp.	Mines at Changsung, Dogae, and Hwasoon	2,000
Copper, metal, primary		Korea Zinc Co. Ltd.	Onsan	4
Do.		LG-Nikko Copper Inc.	Changhang	60
Do.		do.	Onsan	460
Gas, natural		Korea National Oil Corp.	Ulleung Basin	NA
Gold:				
In concentrate	kilograms	Ivanhoe Mines Ltd.	Haenam, Cholla Province	1,600
Refined	do.	Korea Zinc Co. Ltd.	Onsan	50,000
Graphite		Kaerion Graphite Ltd.	Kangwon	NA
Do.		Wolmyong Mining Co.	do.	NA
Lead, metal, primary		do.	do.	200
Nickel, metal		Korea Nickel Corp.	do.	51
Silver:				
In concentrate	kilograms	Ivanhoe Mines Ltd.	Haenam, Cholla Province	3,700
Refined	metric tons	Korea Zinc Co. Ltd.	Onsan	1,000
Steel, crude		Pohang Iron and Steel Co. Ltd.	Kwangyang plant	15,000
Do.		do.	Pohang plant	13,000
Do.		INI Steel Co.	Donggu plant	4,750
Do.		do.	Pohang plant	3,140
Do.		Dongkuk Steel Mill Co. Ltd.	Inchon Works	1,450
Do.		do.	Pohang Works	3,600
Do.		Kia Steel Co. Ltd.	Kunsan	720
Talc		Dongyang Talc Mining Co.	Chungju Mine	NA
Zinc, metal, primary		Korea Zinc Co. Ltd.	Onsan	400
Do.		Young Poong Corp.	Sukpo	200

NA Not available.

THE MINERAL INDUSTRY OF MALAYSIA

By John C. Wu

Malaysia, which borders Brunei, Indonesia, and Thailand in Southeast Asia, was a middle-income developing country in Asia and the Pacific. It has a total land area of about 328,600 square kilometers (km^2) and, in 2003, had a population of about 25.1 million. In 2003, Malaysia's per capita gross domestic product (GDP) based on purchasing power parity was estimated to be $9,471 (International Monetary Fund, 2004§[1]). Malaysia's identified mineral resources were barite, bauxite, carbonate rocks, clays, coal, copper, gold, natural gas, iron ore, crude petroleum, silica, tin, and minerals associated with tin placer deposits, such as ilmenite, monazite, struverite [a columbium (niobium)/tantalum-bearing mineral], and zircon. In 2003, Malaysia's proven reserves of natural gas ranked 14th in the world (Oil & Gas Journal, 2003b). Malaysia was the world's third ranked exporter of liquefied natural gas (LNG) after Indonesia and Algeria in 2003 (Poten.com, 2003§).

Malaysia's economy continued to improve in 2003 owing mainly to growth in the manufacturing and mining sectors. Malaysia's GDP in 1987 constant dollars grew by 5.2% in 2003 compared with 4.1% in 2002. The output of the manufacturing sector grew by 8.2% in 2003 compared with 4.0% in 2002, and the output of the mining and quarrying sector grew by 4.8% in 2003 compared with 3.7% in 2002. The higher growth rate in the mining and quarrying sector was a direct result of increased production of oil and natural gas. In 2003, the mining and quarrying sector contributed 7.2% to Malaysia's GDP; more than 95% of this contribution was by the oil and gas industry. In 2003, Malaysia's GDP in 1987 constant dollars was estimated to be $60.71 billion, of which $4.36 billion was contributed by the mining and quarrying sector (Central Bank of Malaysia, 2004c§; International Monetary Fund, 2004§).

Government Policies and Programs

Because of the economic slowdown during 2002 and early 2003, the Government announced a $1.9 billion economic stimulus package in May 2003 to revive the Malaysian economy. The economic slowdown reportedly was worsened by the outbreak of Severe Acute Respiratory Syndrome (SARS), the Iraq war, and a 40.7% drop in foreign direct investment. The Government intended for the economic stimulus package to encourage private investment, to strengthen the country's competitiveness, and to develop new sources of growth. The package also was expected to help Malaysia reduce its dependence on exports and cope with the difficult economic environment and to enable the country to carve a niche for itself in Southeast Asia.

To attract investments, restrictions on foreign-equity participation in new projects were lifted, and foreign investors were allowed to hold a 100% equity interest in new projects without any export commitments. For new sources of growth, the Government would emphasize and promote tourism, education, and health in the service sector and, in the manufacturing sector, the Government would promote production of value-added goods (Asian Chemical News, 2003).

Environmental Issues

To restore disused mining land, the Forest Research Institute of Malaysia (FRIM) reportedly launched a pilot program in 2001 to rehabilitate the 121.4-hectare (ha) former tin mine site in Bidor, State of Perak, which had been given to the FRIM by the State Government, and to turn the land into tropical forest plantations. According to the FRIM, the project, which was in its third year in 2003, was expected to show full results in 20 to 30 years. The former tin mining land was made up of unproductive sand tailings and slime. The project was to change the condition of the soil by adding fertilizer and nutrients. Under this pilot program, 13 species of forest trees with high commercial value have been planted. The trees that were growing well included mahogany, teak, and such local species as acasia, malabera, meranti bukit, merawan siput jantan, merbau, mersawa, setang, and such local medicinal plants as mengkudu and tongkat Ali. The rehabilitation project was funded by the Government and by the Association of Southeast Asian Nations (ASEAN)-Korea Environmental Cooperation. If the pilot program is proven a success, then it could become an economic model for other former mining land of about 113,700 ha, of which 97,260 ha was unproductive sand tailings and slime. According to past studies, many of those former mining lands contained potentially toxic heavy metals, which were not suitable for growing fruit trees and vegetables. Most former mining land is located in the States of Johor, Kuala Lumpur, Perak, and Selangor (New Straits Times, 2003a, c).

Production

In 2003, Malaysia produced bauxite, coal, carbonate rocks (construction aggregate and limestone), feldspar, gold, ilmenite, iron ore, kaolin, mica, monazite, natural gas, crude petroleum, sand and gravel, silica, struverite, tin, and zircon concentrate. Despite the higher tin prices in the Kuala Lumpur Tin Market, production of tin dropped to an historically low level in 2003 because of depleting ore reserves and lower ore grades. Production of natural gas and crude petroleum increased in 2003 because of increased exports of crude petroleum and LNG. Production of processed mineral products included cement, refined gold, refined lead (secondary), LNG, nitrogen fertilizer materials (ammonia and urea), refined petroleum products, crude steel, titanium dioxide pigment, and refined tin (table 1).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Trade

In 2003, Malaysia's exports increased by 11.5% to $104.97 billion compared with $94.13 billion in 2002; imports increased by 4.9% to $83.62 billion compared with $79.75 billion in 2002. Malaysia's merchandise trade surplus increased by 180% to $10.84 billion compared with $3.87 billion in 2002 owing to a 36% increase in export earnings from palm oil, a 35% increase in export earnings from LNG, and a 35% increase in export earnings from crude petroleum in 2003. Malaysia remained a net exporter of minerals in 2003 because of its large exports of LNG and crude petroleum. In 2003, the major export mineral commodities were crude petroleum ($4.12 billion), LNG ($3.51 billion), and refined tin ($74.7 million) (Central Bank of Malaysia, 2004a§, b§).

Malaysia had a trade deficit in nonfuel minerals and processed mineral products that excluded oil and gas during the past several years. In 2002 (the last year for which data were available), exports of major minerals totaled $38.2 million. Of this total, $24 million was for nonmetallic minerals; $14 million, metallic minerals; and $200,000, others. Imports of major minerals totaled $384 million in 2002. Of this total, $174 million was for coal; $139 million, metallic minerals; and $71 million, nonmetallic minerals. Exports of major processed mineral-based products totaled $2.31 billion in 2002. Of this total, $1.69 billion was for processed metallic mineral products; and $618 million, processed nonmetallic mineral products. Imports of major processed mineral-based products totaled $5.07 billion. Of this total, $4.57 billion was for processed metallic mineral products, and $496 million, processed nonmetallic mineral products (Minerals and Geoscience Department [Malaysia], 2003a, p. 7-9).

Malaysia's imports of minerals and their products continued to outweigh exports in 2003. According to the Ministry of Primary Industry, this situation might prompt the Government to shift its policy and push for greater expansion of the domestic minerals industry. Doing so would make it possible for the country to reduce imports of essential minerals and mineral-based products because most of these imported minerals, such as coal, many nonmetallic minerals, and tin ore, were available in Malaysia (Star, The, 2003a).

Structure of the Mineral Industry

Malaysia's mining industry consisted of a small mining sector of coal and ferrous and nonferrous metals, a small mineral-processing sector of ferrous and nonferrous metals, and a large mining and processing sector of industrial minerals and oil and gas. With the exception of oil and gas, mining and mineral-processing businesses were owned and operated by private companies incorporated in Malaysia. Oil and gas exploration, production, and processing businesses were owned and operated by Petroliam Nasional Berhad (PETRONAS), which was the state-owned oil and gas company, and by joint ventures of PETRONAS and foreign companies. Total employment of the mining and quarrying sector was about 29,000, or about 0.3% of the country's total work force in 2002 (the last year for which data were available) (International Monetary Fund, 2004, p. 6).

The structure of the mineral industry changed in 2003. Production capacity of barite, bauxite, and tin continued to decrease because of depleting ore reserves. Malaysia's sole tin smelter had extended its business into mining by acquiring Radman Hydraulic Tin Bhd. which was one of Malaysia's leading tin miners. The country's cement industry went through further consolidation in 2003 and Hongkew Holdings (M) Sdn. Bhd. resumed construction of an abandoned half-finished cement plant, which was scheduled for completion in the next 2 to 3 years. Malaysia brought onstream seven new offshore oilfields and gasfields and the Malaysia LNG Tiga Sdn. Bhd.'s LNG plant during 2003. As a result, Malaysia's oil and gas production capacity increased by about 4%, and its LNG production capacity, by about 43% in 2003.

Commodity Review

Metals

Aluminum.—In 2003, Charus Development Corp. and its partners, which proposed to build a 500,000-metric-ton-per-year (t/yr) aluminum smelter in the State of Perak, decided to construct its own powerplant instead of purchasing power from the state-owned power company after the Malaysian Prime Minister gave a verbal endorsement. By May 2003, the joint-venture firm, MASCO Aluminium Sdn. Bhd., was established to develop the aluminum smelter. Under a new plan, the $3.42 billion aluminum smelter complex would comprise a primary aluminum smelter that would be constructed at the Lumut Port Industrial Zone in Perak in two stages, and a powerplant. In the first stage of smelter construction, which would be completed by late 2005, the smelter would have a capacity of 230,000 t/yr; in the second stage, which would be completed by late 2008, an additional 460,000 t/yr capacity would be added for a total capacity of 690,000 t/yr (instead of 500,000 t/yr). The dedicated powerplant, which would consist of seven 300-megawatt (MW) coal-fired generating units, would supply power to the aluminum smelter complex. The coal-fired powerplant would be built within 3 kilometers (km) of the aluminum smelter. According to the Perak State Development Corp., construction of the powerplant was expected to begin by late 2003, and construction of the aluminum smelter would begin soon after. The primary aluminum smelter turnkey contractor was awarded to China Metallurgical Equipment Corp., which would use 300 kilovolt-ampere pre-bake cell technology from the Shengyang Aluminium and Magnesium Engineering and Research Institute of China; the smelter project management consultant was Kaiser Engineers of the United Kingdom (Sun, The, 2003a, b).

According to the Dubai-based Gulf International Investment Group Capital (GIIG Capital), its $2 billion aluminum smelter project in Sarawak, East Malaysia, was proceeding according to schedule despite a report that Dubai Aluminium Co. Ltd. (Dubal), which was the project's other partner, had withdrawn from the proposed project for unknown reasons. In March 2003, a memorandum of understanding (MOU) was signed between the state-owned Sarawak Hidro Sdn. Bhd. (SHSB) and Smelter Asia Sdn. Bhd. (SASB), which was a joint-venture company established by Dubal and GIIG Capital to develop the proposed aluminum smelter near Bintulu in Sarawak. Under the MOU, the Bakun Hydroelectric Dam, which would be developed by SHSB, would sell up to 900 MW of electricity, which was more than one-third of its 2,400-MW power-generating capacity, to the SASB's aluminum smelter by 2012. According to SASB, construction of the aluminum smelter was expected to begin by the end of 2003 and the first-phase production of 250,000 metric tons (t) primary aluminum ingots was scheduled to start in 2005. In 2003, SASB was conducting an environmental impact assessment study. The company reportedly planned to install the latest computerized control and fume treatment system into the plant and would also employ the best health, safety, and environmental practices (Star Online, The, 2003§)

Gold.—In 2003, gold was produced mainly from the Penjom Mine in the State of Pahang and a few other small-scale gold mines in the States of Pahang, Kelantan, and Terengganu. A small quantity of gold also was produced as byproduct from tin mines in the State of Selangor.

Avocet Mining PLC, which was Malaysia's largest gold mining company, operated the Penjom Mine at Ampang Jaleh near Kuala Lipis through Specific Resources Malaysia Sdn. Bhd. (a wholly owned subsidiary of Avocet Mining). According to Avocet Mining, the Penjom Mines produced 3,869 kilograms (kg) of gold in the fiscal year that ended on March 31, 2004; 3,387 kg of gold in the fiscal year that ended on March 31, 2003; and 3,339 kg of gold in the fiscal year that ended on March 31, 2002. Increased gold production in the fiscal year that ended on March 31, 2003, was due to higher ore grade and increased recovery rate. In the fiscal year that ended on March 31, 2003, the Penjom Mine mined 14.4 million metric tons (Mt) of ore and waste and processed 523,600 metric tons (t) of ore compared with 20.6 Mt and 539,000 t, respectively, in the fiscal year that ended on March 31, 2002. The average ore head grade was 7.28 grams per metric ton (g/t) gold, and the process recovery rate was 89% compared with 7.14 g/t gold and 87%, respectively, in the fiscal year that ended on March 31, 2002. Plant throughput, however, was slightly reduced owing to milling of harder rock in the fiscal year that ended on March 31, 2003 (Avocet Mining PLC, 2003§, 2004§).

In early 2003, Avocet Mining conducted a re-evaluation of Penjom's mineral resources potential to obtain a better understanding of Penjom's complex geology. Penjom mineral resources were revised according to the improved understanding of mineralization controls developed by the company's exploration team. As a result, the Penjom gold resources estimates were revised to 4,767,500 t with an average grade of 4.46 g/t gold at a 0.8 g/t gold cut-off. Of these gold resources, 811,300 t was measured resources at a grade of 5.63 g/t gold; 1.58 Mt, indicated resources at a grade of 4.95 g/t *gold; 1.62 Mt, in*ferred resources at a grade of 4.16 g/t gold; and 754,300 t, stockpiled resources at a grade of 2.83 g/t gold. For gold exploration in Malaysia, Avocet Mining acquired the right to explore in a 5,600-ha area known as Sungai Luit (River of Money) in the State of Pahang; the company allocated a total of $2.5 million for this project in 2003. The 2003 budget included development of an underground mine at Penjom (Avocet Mining PLC, 2003§).

Iron and Steel.—The amount of low-grade iron ore produced from several small iron mines in the States of Pahang, Perak, and Terengganu was small compared with Malaysia's iron ore requirements for its iron and steel industry. Malaysia exported between 25% and 50% of its low-grade iron ore production to China and Hong Kong and the remainder was consumed by domestic pipe-coating plants and cement plants. All high-grade iron ore requirements for Malaysia's two iron-reduction plants were imported mainly from Brazil, Bahrain, Canada, and Chile. Most other raw-material requirements for Malaysia's iron and steel industry, such as ferroalloys, pig iron, steel and alloy ingots, semifinished steel products, and waste and scrap, were also met by imports (Minerals and Geoscience Department [Malaysia], 2003a, p. 29).

Malaysia's production of direct-reduced iron (DRI) was by the state-owned Perwaja Steel Sdn. Bhd., which operated a 1.2-Mt/yr DRI plant in Kemaman in the State of Terengganu. Production of hot-briquetted iron was by Amsteel Mills Sdn. Bhd., which operated a 700,000-t/yr hot-briquetted iron plant on Labuan Island off Sabah. Malaysia's production of DRI and hot-briquetted iron totaled 1.6 Mt in 2003 compared with 1.08 Mt in 2002 (Midrex Technologies, Inc., 2003§).

Malaysia crude steel production totaled 4.7 Mt in 2002 (the last year for which data were available) compared with 4.1 Mt in 2001. The major crude steel producers were Amsteel Mills, Antara Steel Mill Sdn Bhd., Malayawata Steel Bhd., Malaysia Steel Works (KL) Sdn. Bhd., and Perwaja Steel. These producers imported 3.1 Mt of steel waste and scrap as one of their main feed materials in 2002. In 2002, imports of other raw materials by the iron and steel industry included 1.5 Mt of ferroalloys, 1.3 Mt of iron ore and concentrate, 544,400 t of semifinished products, 520,702 t of iron and steel ingots, 316,100 t of other alloy steel ingots, 225,201 t of pig iron, 196,286 t of DRI and sponge, and 119,779 t of other intermediate ferrous products (Minerals and Geoscience Department [Malaysia], 2003a, p. 28).

In 2002 (the last year for which data were available), Malaysia's imports and exports of iron and steel products were 5.4 Mt and 2.0 Mt, respectively. Apparent steel consumption of all steel products was 7.36 Mt in 2002 compared with 7.39 Mt in 2001. The slight slowdown in overall demand for steel in Malaysia in 2002 was a result of weaker domestic demand and reduced exports (Southeast Asia Iron and Steel Institute, 2003§).

Tin.—Malaysia's tin mine production dropped to a record low because of depleting reserves and lower ore grades despite a higher tin price in 2003. In the Kuala Lumpur Tin Market, the average tin price rose to about $4,950 per ton in 2003 from about $4,030 per metric ton in 2002. During 2003, the total number of operating tin mines averaged 26, and the total number of retreatment plants, 29. Tin produced by the opencast method accounted for 42%; gravel pump, 34%; panning, 15%; retreatment plant, 7%; and dredging, 2%. Malaysia's only underground tin mine was closed in June 2002 (Minerals and Geoscience Department [Malaysia], 2003b).

Following acquisition of a 75% interest in PT Koba Tin from Iluka Resources Ltd. of Australia in April 2002, Malaysia Smelting Corp. Bhd. (MSC) reportedly increased its stake in Marlborough Resources NL of Australia to 30% from 13% in

April 2003. Marlborough Resources, which was one of the two major Australian tin mining companies and one of the major overseas feed suppliers to MSC, operated tin mining and milling facilities with a capacity of 1,300 t /yr of tin in concentrate at the Ardelthan Mine, New South Wales, Australia. MSC reportedly was looking to acquire more low-cost tin producers in Australia and other countries, such as Bolivia, Canada, and China, to improve profit margins ahead of an anticipated growth in the world demand for tin. In Malaysia, MSC was expected to acquire a 25% stake in ZR Network Sdn. Bhd., which owned Malaysia's largest tin mine at the Klian Intan site in the State of Perak. ZR Network, which was a Malaysian trading company, acquired the mining right, lease, and operating assets related to the tin mine operations at the 699.5-ha Klian Intan site from Rahman Hydraulic Tin Bhd. for about $3 million in March 2003 (New Straits Times, 2003d; Star, The, 2003b).

MSC, which operated a 30,000-t/yr tin smelter in Butterworth, imported about 85% of its feed, which was made up of medium-grade tin concentrate and complex tin-bearing materials. The medium-grade feed normally contained 40% to 50% tin. The annual feed for the smelter averaged 40,000 t. MSC products included Electrolytic Grade (4 Nines) Tin, which contained a minimum of 99.99% tin and had a combined impurity that did not exceed 0.01%; MSC 3 Nines Low-Lead Tin, which contained a minimum of 99.9% tin and a maximum of 0.01% lead; and MSC Straits Refined Tin, which contained 99.85% tin. MSC shut down two of its four furnaces and operated at about one-half of its capacity between November 2002 and August 2003 because of weak demand and the tight feed supply. The smelter resumed normal operation at nearly 80% of capacity in the last quarter of 2003 when demand for tin in the world market gradually increased. As a result, refined tin production was estimated to be 18,000 t in 2003 and was expected to increase to 30,000 t in 2004 (Metal Bulletin, 2002; Malaysia Smelting Corp. Bhd., 2003§).

Demand for refined tin for the first 10 months of 2003 increased by 3% to 3,302 t from the same period in 2002. In 2003, the solder industry remained the major end user and accounted for 54% of the total demand followed by the tin-plating industry, 16%; the pewter industry, 13%; and other end users, 17%. Refined tin consumption by the solder industry and other end users included consumption of domestically refined and high-grade (99.9% tin) imported refined tin. Exports of refined tin dropped sharply by 44% to 15,164 t because of the tight feed supply and reduced production of refined tin by MSC during the first three quarters of 2003. Export earnings from refined tin were valued at $75 million compared with $111.9 million in 2002. In 2003, the major buyers of Malaysian refined tin were the Republic of Korea (32.7%), Australia (12.5%), Japan (12.3%), Singapore (11.8%), and South Africa (8.2%) (World Bureau of Metal Statistics, 2004).

Industrial Minerals

Cement.—Cement production increased by 20.3% in 2003 because of increased exports and continued growth in domestic demand; cement production was equivalent to about 60% of the industry's installed capacity. According to an estimate by the Cement and Concrete Association of Malaysia, domestic demand for cement grew by about 9% to 13 Mt, and exports of cement and clinker grew by about 39% to 3.9 Mt in 2003. As of 2003, Malaysia's installed capacity of cement and clinker was 28.3 Mt/yr and 17.8 Mt/yr, respectively (International Cement Review, 2003a; Cement and Concrete Association of Malaysia, 2003§).

On June 27, 2003, Malayan Cement Bhd. (MC), which owned 100% equity interest in Associated Pan Malaysia Cement Sdn. Bhd. and 77.1% interest in Kedah Cement Holding Bhd., changed its name to Lafarge Malayan Cement Bhd. (LMC). LMC, which had a local market share of about 45% and had plants strategically located in Rawang, Kanthan, Langkawi, and Pasir Gudang in peninsular Malaysia, was Malaysia's leading cement producer with a total cement and clinker production capacity of 12.8 Mt/yr and 7.9 Mt/yr, respectively. LMC also owned and operated a cement-grinding plant and a bulk-import terminal in Singapore (Kuala Lumpur Stock Exchange, 2003§). LMC was a subsidiary of Lafarge SA of France, which owned a 60.88% interest in LMC through the acquisition of Blue Circle Industries plc of the United Kingdom in July 2001.

Despite the cement industry's excess capacity in Malaysia, construction of an integrated cement plant with a clinker and cement capacity of 1.2 Mt/yr and 1.3 Mt/yr, respectively, was to be completed by Hongkew Holdings (M) Sdn. Bhd. in Gus Musang, State of Kalantan, within the next 2 to 3 years in anticipation of future growth in demand for cement in the local and overseas markets. In February 2003, YTL Cement Bhd., through its wholly-owned subsidiary YTL Cement Marketing Sdn Bhd., signed an off-take agreement with Hongkew Holdings as the sole distributor of cement produced by Hongkew Holdings' future cement plant in Gua Musang, State of Kalantan. Hongkew Holdings reportedly obtained its license in the mid-1990s and started its plant construction before the 1997 Asian financial crisis. By 2003, the Gua Musang plant was about 50% completed. Hongkew Holdings, which had spent about $26 million on civil work and some machinery imports, was to raise $105 million capital by issuing bonds following the signing of the agreement with YTL Cement to complete the plant construction that had been abandoned since August 1998 (International Cement Review, 2003b; YTL Cement Bhd., 2003§).

In September 2003, YTL Cement acquired the remaining 50% interest in Pahang Cement Sdn. Bhd from the Pahang State Government through Perbadanan Setiausaha Kerajaan Pahang and Pasdec Corporation Sdn Bhd. Pahang Cement, which had an integrated plant with a capacity of 1.3 Mt/yr cement and 1.2 Mt/yr clinker, became a wholly owned subsidiary of YTL Cement (YTL Cement Bhd., 2003§).

Nitrogen (Fertilizer Materials).—Malaysia produced ammonia and urea using natural gas as feedstock. ASEAN Bintulu Fertilizer Sdn. Bhd. (ABF) and PETRONAS Fertilizer (Kedah) Sdn. Bhd. (PFK) produced ammonia and granular urea, and PETRONAS Ammonia Sdn. Bhd. (PA) produced only ammonia. Ammonia production capacity (in nitrogen content) of ABF in Bintulu, State of Sarawak, was 395,000 t/yr; PFK in Gurun, State of Kedah, 378,000 t/yr; and PA in Kerth, State of Terengganu, 370,000 t/yr. Granular urea production capacity (in gross weight) of ABF in Bintulu, State of Sarawak, and PFK in Gurun, State pf Kedah, was 600,000 t/yr and 650,000 t/yr, respectively (PETRONAS, 2003b§).

In 2003, Malaysia produced 909,500 t of ammonia (in nitrogen content), of which 575,800 t was delivered to the home market and 340,900 t was exported to overseas markets. Urea production totaled 552,700 t, of which 150,900 t was consumed domestically and 375,100 t was exported mainly to Asian markets (International Fertilizer Industry Association, 2004a, b).

Mineral Fuels

Natural Gas and Petroleum.—In 2003, Malaysia was a net exporter of natural gas and crude petroleum. Production of natural gas increased to an average of 142 billion cubic meters per day from 132 billion cubic meters per day in 2002. Production of crude petroleum, which included condensate, increased to an average of 735,000 barrels per day (bbl/d) from 698,000 bbl/d in 2002. Malaysia exported about 52% of its crude petroleum and condensate production and about 50% of its natural gas production in the form of LNG in 2003 (Central Bank of Malaysia, 2004b§).

In 2003, Malaysia brought seven oilfields and gasfields onstream. The total number of producing fields increased to 63 from 56. Of those, 48 were oilfields, and 15 were gasfields (PETRONAS, 2003a§). In February, Exxon Mobil Corp. brought the Bintang Gasfield onstream through its wholly owned subsidiary ExxonMobil Exploration and Production Malaysia Inc. (EMEPMI); the field is located about 220 km offshore State of Terengganu. The Bintang contained about 28.3 billion cubic meters of natural gas and had a peak production rate of about 10 million cubic meters per day. The Bintang was developed by the 50-50 joint venture of PETRONAS through its wholly owned subsidiary PETRONAS Carigali Sdn Bhd. (PCSB) and ExxonMobil through EMEPMI, which was the operator (Exxon Mobil Corp., 2003§).

In May, Murphy Sarawak Oil Co. Ltd. (MSOC) (a wholly owned subsidiary of Murphy Oil Corp. of the United States) brought its West Patricia Oilfield onstream. The West Patricia, which is located in block SK 309 about 40 km offshore Bintulu, State of Sarawak, was developed by the joint venture of Murphy Oil, which was the operator (85%), and PCSB (15%) and had a production capacity of 15,000 bbl/d of oil (New Straits Times, 2003b).

As a result of the exploration success in the deepwater areas in the past 2 years, Malaysia's natural gas and crude petroleum proven and probable reserves increased to 2.52 trillion cubic meters and 4.54 billion barrels, respectively, compared with 2.48 trillion cubic meters and 4.24 billion barrels, respectively, in 2002 (PETRONAS, 2003a§). The country's proven reserves of natural gas were estimated to be 2.12 trillion cubic meters and accounted for 1.2% of the world total, and its proven reserves of crude petroleum were estimated to be 3 billion barrels and accounted for 0.2% of the world total in 2003 (Oil & Gas Journal, 2003b).

In January, PETRONAS awarded two production-sharing contracts (PSCs) to Murphy Oil and PCSB for oil and gas exploration for deepwater blocks L and M in its exclusive economic zone (EEZ) offshore Sabah, Malaysia. Under the terms of the PSC, Murphy Sabah Oil Co. Ltd. (a wholly owned subsidiary of Murphy Oil) would have a 60% working interest in block L and a 70% in block M. PCSB would own the remaining 40% and 30% working interests in blocks L and M, respectively. Under the terms of the PSCs, the contractors would acquire and process 500 km^2 of 3-D (three-dimensional) seismic data and drill two exploration wells in each block to a minimum depth of 7,000 meters. Each contractor was expected to spend a minimum of $21 million for exploring blocks L and M (PETRONAS, 2003e§). Murphy Oil has been awarded a total of eight blocks in Malaysia's offshore area since 1999.

In 2002, Brunei awarded two contracts to Total S.A. and Royal Dutch/Shell for oil and gas exploration for deepwater blocks J and K in its EEZ offshore Brunei. Total S.A. and Royal Dutch/Shell (Brunei's contractors) and Murphy Oil and PCSB (Malaysia's contractors) were awarded the right to prospect in the overlapped EEZ area. During the negotiation talks to resolve the dispute, Malaysia proposed that the EEZ area be treated as a joint-development area and offered a 50-50 profit-sharing arrangement (Far Eastern Economic Review, 2003). The dispute still had not been resolved by yearend.

In September, PETRONAS signed a new PSC with PCSB and Sarawak Shell Bhd. for Baram Delta offshore Sarawak following the expiration of the old PSC, which had been awarded in 1988. Under the new contract, Sarawak Shell would use the latest technologies and its worldwide experience to raise the oilfield recovery factor and to extend the life of the aging oil and gas facilities in the Baram Delta that covers the Delta's Bakau, Baram, Baronia, Betty, Bokor, Failey Baram, West Lutong, Tukau, and Siwa oilfields and three small undeveloped nearby discoveries (Baronis Timur Laut, Fatimah, and Tanjung Baram). The new contract was owned 60% by PCSB and 40% by Sarawak Shell, which was the operator (PETRONAS, 2003f§).

Total LNG production by Malaysia LNG Sdn. Bhd. (MLNG), Malaysia LNG Dua Sdn. Bhd. (MLNG-2), and Malaysia's third and newest LNG plant, Malaysia LNG Tiga Sdn. Bhd. (MLNG-3), increased to 17.4 Mt compared with 15 Mt in 2002. The construction of the MLNG-3 plant and related facilities next to the two existing plants in Bintulu, State of Sarawak, was completed by Halliburton Co.'s subsidiary Kellogg Brown & Root of the United States and JCG Corp. of Japan in 2003. The first 3.4-Mt/yr natural gas liquefaction train began operations in May 2003, and the second 3.4-Mt/yr train, in October 2003. The related facilities of MLNG-3's LNG plant included a 120,000-cubic-meter-capacity LNG storage tank and an LNG loading jetty. The plant was owned and operated by MLNG-3. MLNG-3 was a joint venture of PETRONAS (60%), Shell Gas Holdings (Malaysia) Ltd. (15%), the Government of the State of Sarawak and Nippon Oil LNG (Netherlands) BV (10% each), and Diamond Gas Netherlands BV (5%). Malaysia's three LNG complexes in Bintulu ranked as the world's single largest LNG production facility with a combined capacity of about 23 Mt/yr (Oil & Gas Journal, 2003a).

In March, MLNG and MLNG-3 signed two separate sale and purchase agreements (SPAs), which were valued at more than $20 billion, to supply LNG to the Tokyo Electric Power Co. Inc. and Tokyo Gas Co. Ltd. According to one of the two SPAs, MLNG should supply Tokyo Electric Power and Tokyo Gas with up to 7.4 Mt/yr of LNG for 15 years beginning in April 2003 and with an option to extend for an additional 5 years. The 15-year contract was worth about $20 billion at the prevailing prices in 2003. The other SPA was signed between MLNG Tiga and Tokyo Electric Power for the supply of up to 540,000 t/yr of LNG for 1 year beginning in April 2003 and with an option to extend the time if mutually agreed upon by the two parties (PETRONAS, 2003c§).

In May, MLNG Tiga signed an SPA with Korea Gas Corp. to supply up to 2 Mt/yr of LNG for 7 years beginning in May 2003. The contract was valued at about $3.2 billion at the prevailing prices in 2003 (PETRONAS, 2003d§).

Outlook

The oil and gas industry is expected to continue to dominate the Malaysian mining and quarrying secto, and the Government is expected to continue the policy of developing its hydrocarbon resources with a special emphasis on the development of its natural gas resources for industrial, petrochemical, and power-generation projects approved by the Government during the next 4 to 5 years. Production of natural gas is expected to grow faster than that of crude petroleum. Malaysia could continue to enjoy a mineral trade surplus during the next 4 to 5 years because of its large export earnings from natural gas and crude petroleum.

The country's metallic and nonmetallic minerals mining industries are expected to continue to shrink during the next 2 to 3 years. The coal mining industry, however, may expand its capacity during the next 4 to 5 years if the Government trade policy shifts to encourage development of domestic resources rather than imports. Under the Government's 2003 economic stimulus package, the country's production capacity of value-added mineral products is expected to increase. If the two pending primary aluminum smelter proposals are implemented during the next 2 to 3 years, then Malaysia could become an important primary aluminum producer in Southeast Asia.

During the next 2 years, Malaysia's economy is expected to continue to grow at a faster pace than that of 2002. Malaysia's GDP is projected to grow at a rate of 5.7% in 2004 and 6.0% in 2005 (International Monetary Fund, 2004§).

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Major Source of Information

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Major Publications

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- Statistical Bulletin, Malaysia, monthly.
- Yearbook of Statistics, Malaysia, annual.

Malaysian Chamber of Mines:
- Annual Report, annual.
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- Annual Report and Malaysia Minerals Yearbook, annual.
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TABLE 1
MALAYSIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1999	2000	2001	2002	2003[p]
METALS						
Aluminum, bauxite, gross weight	thousand tons	223	123	64	40	6
Columbium-tantalum metals, struverite, gross weight		675	969	8,430	2,298	2,619
Copper, mine output, Cu content, Sabah		4,600	--	--	--	--
Gold, mine output, Au content[3]	kilograms	3,449	4,026	3,965	4,289	4,739
Iron and steel:						
Iron ore and concentrate	thousand tons	337	259	376	404	597
Steel, crude	do.	2,770	3,650	4,100	4,722 [r]	4,700 [e]
Lead metal, secondary		33,000	35,300	38,000	40,000	40,000
Rare-earth metals, monazite, gross weight		1,147	818	643	441 [r]	795
Silver, mine output, Ag content[3]	kilograms	2,744	5	3	--	--
Tin:						
Mine output, Sn content		7,339	6,307	4,972	4,215	3,359
Metal, smelter		28,913	26,228	30,417	30,887 [r]	18,250
Titanium:						
Ilmenite concentrate, gross weight		127,695	124,801	129,750	106,046	95,148
Dioxide, gross weight[e]		46,000	46,000	50,000	56,000	56,000
Zirconium, zircon concentrate, gross weight		1,763	3,642	3,768	5,292 [r]	3,456
INDUSTRIAL MINERALS						
Barite		13,506	7,274	649	3,082 [r]	--
Cement, hydraulic	thousand tons	10,104	11,445	13,820	14,336	17,243
Clays and earth materials	do.	33,083	79,485	29,596	23,092 [r]	23,000 [e]
Clays, kaolin		213,973	233,885	364,458	323,916 [r]	376,958
Feldspar		26,940	29,895	40,509	30,819 [r]	31,000 [e]
Mica		3,675	3,835	4,107	3,669	3,609
Nitrogen, N content of ammonia		432,000	604,800	726,000	847,900	909,500
Sand and gravel	thousand tons	33,351	21,497	15,020	19,574 [r]	20,000 [e]
Silica sand, peninsular Malaysia and Sarawak		508,723	446,838	575,105	447,398 [r]	450,000 [e]
Stone:						
Aggregate	thousand tons	58,588	66,670	66,996	84,934	85,000 [e]
Dolomite		4,250	4,030	2,850	--	--
Limestone	thousand tons	23,515	26,086	32,503	27,450 [r]	30,000 [e]
MINERAL FUELS AND RELATED MATERIALS						
Coal		308,502	382,942	497,733	352,513	172,820
Gas, natural:[4]						
Gross	million cubic meters	51,376	56,929	58,751	60,791 [r]	65,173
Net[5]	do.	40,844	45,259	46,707	48,329 [r]	51,813
Liquefied natural gas	thousand tons	15,390	15,169	15,423	15,025	17,402
Petroleum:[4]						
Crude and condensate	thousand 42-gallon barrels	252,115	249,159	243,696	254,770 [r]	269,370
Refinery products:						
Gasoline	do.	25,498	22,205	25,500 [e]	26,000 [e]	25,000 [e]
Jet fuel[e]	do.	7,500	7,500	7,500	7,500	7,500
Kerosene	do.	15,945	19,631	25,522 [r]	23,688 [r]	24,000 [e]
Diesel	do.	43,725	57,559	55,500 [e]	57,000 [e]	56,000 [e]
Residual fuel oil	do.	11,972	12,413	12,500 [e]	15,000 [e]	14,000 [e]
Other[e, 6]	do.	15,000	15,500	15,500	15,000	15,000
Total[7]	do.	120,000	135,000	142,000	144,000 [r]	142,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. [r] Revised. -- Zero.

[1] Table includes data available through July 2, 2004.

[2] In addition to the commodities listed, a variety of crude construction materials, which include clays and stone, fertilizers, and salt, is produced, but not reported, and information is inadequate to make reliable estimates of output levels.

[3] Includes byproduct from a copper mine in Sabah, tin mines in peninsular Malaysia, and gold mines in peninsular Malaysia and Sarawak.

[4] Includes production from peninsular Malaysia, Sabah, and Sarawak.

[5] Gross less volume of reinjected and flared.

[6] Includes liquefied petroleum gas, naphthas, and lubricants.

[7] Data are rounded to three significant digits; may not add to total shown.

Sources: Ministry of Primary Industry, Minerals and Geoscience Department (Kuala Lumpur), Malaysian Minerals Yearbook 2001, Monthly Statistics on the Mining Industry in Malaysia; Department of Statistics (Kuala Lumpur), Monthly Statistical Bulletin, April 2004; U.S. Geological Survey Minerals Questionnaire, 2002; and Southeast Asia Iron and Steel Institute, Steel Statistical Yearbook, 2003.

TABLE 2

MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bauxite		Johore Mining and Stevedoring Co. Sdn. Bhd. (ALCAN Ltd. of Canada, 61%; local investors and other, 39%)	Teluk Rumania and Sg. Rengit, Johor	400
Cement[1]		Cement Industries of Malaysia Bhd. (United Engineers Malaysia Bhd., 53.97%; others, 46.03%)	Kangar, Perlis	2,000 1,600*
Do.		Lafarge Malayan Cement Bhd. (majority owned subsidiary of Lafarge S.A.)	Rawang, Selangor; Kanthan, Perak, Langkawi, Kedah; and Pasir Gudang, Johor	12,800 7,900*
Do.		Negeri Sembilan Cement Industries Sdn. Bhd. (wholly owned subsidiary of Cement Industries of Malaysia Berhad)	Bahau, Negeri Sembilan	1,400 1,200*
Do.		Pahang Cement Sdn Bhd. (50-50 joint venture of Pahang State government and YTL Cement Berhad)	Bukit Sagu, Pahang	1,300 1,200*
Do.		Perak-Hanjoong Simen Sdn. Bhd. (Gopeng Bhd., 45%; Korea Heavy Industries and Construction Co. and others, 55%)	Padang Rengas, Perak	3,400 3,000*
Do.		Tasek Corp. (publicly owned company)	Ipoh, Perak	2,300 2,300*
Gas:				
Natural	million cubic meters per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	45
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	3
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	80
Liquefied		Malaysia LNG Sdn. Bhd. (Petroliam Nasional Berhad, 65%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 5%)	Tanjung Kidurong, Bintulu, Sarawak	8,100
Do.		Malaysia LNG Dua Sdn. Bhd. (Petroliam Nasional Berhad, 60%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 10%)	do.	7,800
Do.		Malaysia LNG Tiga Sdn. Bhd. (Petroliam Nasional Berhad, 60%; Shell Gas N.V., 15%; Nippon Oil LNG (Netherlands) BV, 10%; Sarawak State government, 10%; Diamond Gas Netherlands BV, 5%)	do.	6,800
Gold, refined	kilograms	Specific Resources Sdn. Bhd. (joint venture of Pahang State Development Corp. and Avocet Mining plc of the United Kingdom)	Penjom, Pahang	4,000
Iron and steel:				
Hot-briquetted iron		Amsteel Mills Sdn. Bhd. (wholly owned subsidiary of Amsteel Corp.)	Labuan Island, offshore Sabah	800
Direct-reduced iron		Perwaja Steel Sdn. Bhd. (Maju Holdings Sdn. Bhd., 51%; Lion Group, 30%; Terengganu State government, 19%)	Kemaman, Terengganu	1,200
Crude steel		Amsteel Mills Sdn. Bhd. (wholly owned subsidiary of Amsteel Corp.)	Klang, Selangor	750
Do.		Perwaja Steel Sdn. Bhd. (Maju Holdings Sdn. Bhd., 51%; Lion Group, 30%; Terengganu State government, 19%)	Kermaman, Terengganu	800
Do.		Southern Steel Bhd. (Camerlin [a member of Hong Leong Group Malaysia], 40.75%; Natsteel Ltd., 27.03; other, 32.22%)	Prai, Penang	1,200
Nitrogen, ammonia		Asean Bintulu Fertilizer Sdn. Bhd. (Petroliam Nasional Berhad, 63.5%; P.T. Pupuk Sriwidjaja Indonesia, 13%; Thai Ministry of Finance, 13%; Philippines National Development Co., 9.5%; Singapore Temasek Holdings Pte. Ltd., 1%)	Bintulu, Sarawak	395
Do.		PETRONAS Fertilizer Kedah Sdn. Bhd. (wholly owned subsidiary of Petroliam Nasional Berhad)	Gurun, Kedah	378
Do.		PETRONAS Ammonia Sdn Bhd. (wholly owned subsidiary of Petroliam Nasional Berhad)	Kerth, Terengganu	370
Petroleum, crude	thousand 42-gallon barrels per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	390
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	100
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	184

See footnote at end of table.

TABLE 2--Continued
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum, crude--Continued:	thousand 42-gallon barrels per day	Sarawak Shell Bhd.	Offshore Sarawak	184
Do.	do.	PETRONAS Carigali Sdn. Bhd.	Offshore Terengganu	22
Do.	do.	Murphy Sarawak Oil Co. Ltd.	Offshore Sarawak	15
Tin:				
Concentrate		Delima Industries Sdn. Bhd.	Dengkil, Selangor	1.1
Do.		Maiju Sama Sdn. Bhd.	Puchong, Selangor	1.6
Do.		New Lahat Mines Sdn. Bhd.	Lahat, Perak	0.3
Do.		Omsam Telecommunication Sdn. Bhd.	Bakap and Batu Gajah, Perak	0.5
Do.		Rahman Hydraulic Tin Bhd.	Klian Intan, Perak	1.2
Do.		S.E.K. (M) Sdn. Bhd.	Kampar, Perak	0.4
Do.		Tasek Abadi Sdn Bhd.	Senudong and Kampar, Perak	0.5
Refined		Malaysia Smelting Corp. Bhd. (The Straits Trading Co. Ltd., 37.44%; Malaysia Mining Corp., 37.44%; others, 25.12%)	Butterworth, Penang	30
Titanium, dioxide		Huntsman Tioxide Sdn. Bhd. (a subsidiary of HuntsmanTioxide of the United Kingdom)	Kemaman, Terengganu	56

[1] All companies operated integrated plants. Annual capacity is for cement production; an asterisk (*) denotes the clinker capacity.

THE MINERAL INDUSTRY OF MONGOLIA

By Pui-Kwan Tse

Mongolia is a landlocked country that is bordered by China to the south and Russia to the north. The total land mass is about 1.6 million square kilometers, and in 2003, the population was less than 2.5 million. Since the 1990s, Mongolia has transformed steadily from a centrally planned economy into a market economy. After several years of harsh winters, the weather conditions improved in 2003, and the output of the agriculture sector, which accounted for 20% of the country's gross domestic product (GDP) and employed 40% of its labor force, expanded by 4.5%. The country's economy grew by 5.5%, which exceeded the Government's target of 5%. Industrial output increased by only 0.9% because of a decline in production in the mining and textile sectors. Continued economic growth helped improve living standards and raised income. The country had a per capita income of about $450, which made it one of the poorest countries in the region (Asian Development Bank, 2004, p. 60; International Monetary Fund, 2004, p. 195).

Since the 1990s, the Asian Development Bank and the World Bank have provided loans and assistance to the Mongolian Government to promote the development of a sound financial sector to support private-sector-led growth. In 2003, the private sector contributed about 80% of the GDP. The two banks continued to support Mongolia's participation in regional cooperation. Mongolia and China have agreed to cooperate on environmental, investment, trade, and transport initiatives. A north-south road system to link China and Russia through the major economic centers in Mongolia, which included the capital of Ulaanbaatar, was under study. This road system would help reduce Mongolia's geographic isolation and provide access to the markets of its two neighboring countries (Asian Development Bank, 2003§[1]).

In December 2003, the Parliament approved amendments to the Law of Corporate Income Tax and the Law on Excise Tax Stamp. Effective January 1, 2004, the corporate tax ceiling will be reduced to 30% from 40%. Various tax incentives for foreign investment companies will be terminated. Domestic and international companies will be allowed to print excise tax stamps; before 2004, only the Government security companies had this authority. The Parliament also approved a twofold increase in employee pensions and salaries that will take effect on January 1, 2004, and February 1, 2004, respectively. The Government submitted an amendment to the Parliament that would abolish the 10% value-added tax on gold sales and adjust the royalty for mineral extraction to 7.5% for placer gold deposits and to 2.5% for hard-rock mineral deposits (Mongolian News, 2003a§). The Government submitted an amendment of the mineral law to the Parliament in 2002; the amendment was expected to be approved in January 2004.

Mongolia has extensive and largely untapped mineral resources. Owing to poor infrastructure, only about 30% of the country's natural resources has been explored thoroughly. The mining sector was expected to play an important role in the country's future economic development. The Government adopted several long-term programs to explore for and develop metallic and nonmetallic minerals, such as coal, copper, fluorspar, gold, oil, and silver. The Government also encouraged foreign investment and participation in exploration, exploitation, and processing of minerals. In 2003, mining accounted for about 30% of the country's industrial output and 60% of its export revenue (Discover Mongolia, 2003).

The country's trade has been heavily influenced by economic developments in China and Russia. In 2003, Mongolia's total trade increased by 14.2% to $1.39 billion. Because of weak global metal market prices, exports increased by 14.5% to $600.2 million. Owing to an increased demand for agricultural products, imports increased by 14.0% to $787.3 million. The value of metal and mineral exports and imports accounted for about 40% of the country's total trade value. Mongolia exported nearly all its output of copper concentrates and molybdenum concentrates to China and nearly all its fluorspar output to Russia. Petroleum and petroleum products remained the leading imported commodities followed by textiles and flour. China and Russia were Mongolia's two major trading partners (Mongolia Gateway, 2004§).

The leading mining operation in Mongolia, Erdenet Mining Corp., maintained its mining output of more than 24 million metric tons per year (Mt/yr) of ore and produced concentrates that contained more than 130,000 metric tons (t) of copper and 1,500 t of molybdenum. Because of the decline in the average ore grade, the output of copper in concentrates decreased to 130,270 t in 2003. Owing to improved ore grades and recovery efficiencies, the output of molybdenum in concentrates increased to 1,793 t. Outokumpu Group of Finland signed a memorandum of understanding with Erdenet to build a 35,000-t/yr copper products plant that would use Outokumpu's HydroCopper process. Erdenet and Samsung Corp. of the Republic of Korea signed a joint-venture agreement to build a 25,000-metric-ton-per-year (t/yr) copper cathode plant that would use Outokumpu's solvent extraction-electrowinning technology at Erdenet (Outokumpu Group, 2004; Erdenet Mining Corp., 2003§).

In 2003, Ivanhoe Mines Ltd. of Canada and a Chinese state-owned company, China International Trust & Investment Corp. (CITIC), signed an agreement to form a strategic alliance for mineral exploration, development, and production projects. CITIC agreed to help Ivanhoe raise capital from international financial markets for selected projects. CITIC also agreed to help facilitate discussions between Chinese and Mongolian Government officials regarding a proposed 290-kilometer railway that would link Bayan Obo in China and Oyu Tolgoi, Mongolia. In June 2003, Government officials from China and

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Mongolia agreed to cooperate in the development of mineral resources in Mongolia. China will pledge $300 million in aid for road and railway construction that will link Mongolia's South Gobi Desert and the Chinese border.

Ivanhoe continued to work on its Oyu Tolgoiproject at Oyu Tolgoi in Umnogovi Province in the South Gobi Desert. The company completed the feasibility study for the development of two gold-rich open pits in the southwestern and central deposits at Oyu Tolgoi in 2003 and planned to develop the project in two stages. During the first stage, the company would build a 20-Mt/yr ore concentrator mill to produce between 300,000 t/yr and 400,000 t/yr of copper in concentrates. Gold production was expected to be 12.5 t/yr. Initial capital investment was estimated to be $529 million and the mine would begin production in 2007. During the second stage, the company would expand ore output capacity to 40 Mt/yr by developing the open pit and underground mine at Hugo North. The Oyu Tolgoi project was projected to have the capability to sustain ore output of 40 Mt/yr for 25 years (Mining Journal, 2004).

Gold mining in Mongolia increased significantly during the past decade. The number of companies engaged in gold mining grew to more than 100, and more than 12 t of gold was produced. Most of the companies were placer gold producers, and many placer deposits were nearly depleted; as a result, gold output was expected to decline in the near future. Domestic gold demand was mainly for jewelry, and the country exported more than 90% of total output, mainly to China. Before 2002, gold producers were required to sell their output at a fixed price to the Bank of Mongolia. Recently, the Government allowed some gold producers and commercial banks to export gold (Mining Journal, 2003).

The Boroo Gold Mine was expected to begin operation in early 2004. The mine was operated by Boroo Gold Company, which was 95% owned by AGR Ltd. of Australia and 5% by Mongolian Altai Trading Co. In March 2002, Cameco Gold Inc. (CGI) acquired a 52% interest in AGR. Under the purchase agreement, CGI would oversee the construction, and AGR would operate the mine. The capital cost for the development of the mine was estimated to be $72 million. The mine is located about 110 kilometers (km) north of Ulaanbaatar, Bayangol district, Selenge Province. Probable reserves at Boroo were estimated to be 10.2 Mt at a grade of 3.52 grams per ton (g/t) gold. The mill was designed to process 1.74 Mt/yr of ore by using conventional processing technology to produce 4.6 t/yr of bullion with grades of 85% gold and 5% silver for 8 years (Cameco Corp., 2004).

Entree Gold Inc. of Canada continued exploration at the Shivee Tolgoi concessions, which encompassed a total area of 179,594 hectares and were completely surrounded by Ivanhoe's Oyu Tolgoi prospect. Twenty-five ore samples were collected and analyzed. Results indicated that 10 samples contained more than 0.5 g/t gold, 5 samples had more than 1.0 g/t gold, and 1 sample had 22.3 g/t gold. The company planned to continue to conduct gold sample analyses and geochemical and geophysical surveys of the property during 2004 (Entree Gold Inc., 2004).

International Uranium Corp. (IUC) of Canada through its subsidiary International Uranium Co. (Mongolia) Ltd. held 71 exploration licenses that covered an area in excess of 4.4 million hectares in Mongolia. The company planned to explore for base metals and gold in these areas. In 2003, the company focused on the Tsagaan Tolgoi project in western Mongolia. The company drilled 16 holes, which totaled approximately 3,000 meters, and identified at least 4 copper-gold targets in the Shiveen Gol intrusive complex. Several rock chip samples from the area contained an excess of 1% copper. Shiveen Gol was one of several copper anomalies within the Tsagaan Tolgoi project. IUC signed a letter of intent to transfer all its base and precious metals exploration in Mongolia to Fortress IT Corp. for 28 million shares of Fortress and thus became a major shareholder in Fortress (International Uranium Corp., 2004).

Asia Gold Corp. of Canada reported that the company had discovered significant gold mineralization at the Yagaan prospect, which is located 300 km west of Dalanzadgad in southern Mongolia, and about 400 km west of Ivanhoe's Oyu Tolgoi project. The property is located within the Tian Shan copper-gold metallogenic belt in China. In 2003, 98 rock samples from the area were collected; 11 of these samples contained more than 1 g/t gold. The maximum gold assay was 21.4 g/t (Asia Gold Corp., 2004a). Asia Gold also carried out exploration at the Oyut Ovoo prospect, which is located 270 km south of Ulaanbaatar and about 300 km north of Ivanhoe's Oyu Tolgoi project. Of the 505 rock samples collected, 46 of the samples had more than 1% copper and 112 samples had more than 0.3% copper. These samples also contained significant amounts of molybdenum. The company planned to continue exploration at the Yagaan and the Oyut Ovoo prospects in 2004 (Asia Gold Corp., 2004b).

In 2003, UGL Enterprises Ltd. acquired three exploration licenses—Gold Ram, Huren Tolgoi, and Khondloy in Mongolia. UGL acquired a 100% share of the Gold Ram and an 80% share of the Huren Tolgoi from Canrim Minerals Ltd., which was a British Virgin Islands holding company. Gold Ram is located in the west-central portion of Omnogovi Province 75 km southwest of Dalanadgad in western Mongolia. Previous Russian-Mongolian surveys indicated significant gold mineralization in mesothermal quartz veins within Nomhon formation sediments. The Huren Tolgoi project was held by Canrim under an option agreement with Monresources Co. Ltd. The Huren Tolgoi property is located in Bayanhongor Province, about 50 km south of the city of Bayanhongor, which is located 650 km southwest of Ulaanbaatar. The Huren Tolgoi is surrounded by Ivanhoe's Saran Uul property. Previous Japanese and Mongolian exploration indicated that the area has copper-gold porphyry occurrences. The Khondloy property is located in Bayanhongor Province. In the 1980s, Russian explorers recorded that copper-gold mineralization was found on the surface, but no assay results were reported. The company planned to conduct a comprehensive exploration that would include soil geochemical and geophysical analyses in 2004 (UGL Enterprises Ltd., 2003; 2004).

In 2003, Mongolrostsvetmet Mining and Trading Corp.'s subsidiary Ayrag Mining Corp. and One-O-One Inc. of the United States formed the 50-50 joint venture Mongolia Minerals\ to build an aluminum trifluoride plant to produce value-added products in Mongolia. The plant had a designed capacity of 30,000 t/yr and was scheduled to come onstream in 2005 or 2006. All the fluorspar consumed by the plant will be sourced in Mongolia, mainly from the company's own mines. Mongolia Minerals and Davy Process Technology (Switzerland) AG worked jointly to develop the processing technology. The company hoped to export its products to the world market. Ayrag had an output capacity of 180,000 t/yr of acid-grade fluorspar and 100,000 t/yr metallurgical-grade fluorspar (Industrial Minerals, 2003).

The Government planned to privatize the Metallurgy Plant in Darkham. In 2001, Mongolrostsvetmet won the management contract to run the plant. Since Mongolrostsvetmet took over the plant's management, the financial and operational conditions of the plant have improved. The plant had a crude steel annual output capacity of 100,000 t using local steel scraps. The Government planned to renovate the plant by replacing out-of-date equipment and to add an ironmaking facility to solve the problem of steel scrap shortages (Mongolian News, 2004§).

China No. 15 Metallurgical Construction Co. won the bid on the construction of Tsaiminerals' Tumurtiin Ovoo Mine near the town of Sukhe Bator. The mine, which was jointly owned by China Nonferrous Metal Industry Engineering Co. Ltd. (51%) and Mentalimpex of Mongolia (49%), could produce 68,000 t/yr of zinc concentrates for 27 years. The mine output will be exported mainly to China (China Metal Bulletin, 2004).

Geologists had discovered that the geologic formations of the Tamsag and the East Gobi Basins in eastern Mongolia have many similarities with the Erlian and the Khailaar Basins in China. Recent studies showed that the Tamsag Basin had oil reserves of between 50 million barrels and 1.5 billion barrels. SOCO International plc of the United Kingdom explored on the contract block area of XIX, XXI, and XXII in the Tamsag Basin and planned to produce 60,000 t of oil from 15 extraction wells by 2004. Dongsheng Petroleum of China and Roc Oil Co. of Australia jointly explored on the contract block area of XIII and XIV in the eastern Gobi Basin under a production-sharing contract (Mongolian News, 2003b§).

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Major Source of Information

Mineral Resources Authority
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E-mail: mram@magicnet.mn
Internet: http://www.mram.mn

Major Publications

National Statistical Office of Mongolia, Ulaanbaatar, Mongolia:
Statistical Bulletin, monthly.
Mongolian Statistical Yearbook, annual.

TABLE 1
MONGOLIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1999	2000	2001	2002	2003[e]
Cement, hydraulic	thousand tons	104	92	68	148	150
Coal	do.	4,952	5,185	5,141	5,307	5,900
Copper:						
Mine output, Cu content		126,700 [3]	125,227	133,503	131,705	130,270 [3]
Metal, refined		1,545	641	1,476	1,500	1,600
Fluorspar:						
Acid grade	thousand tons	100	111	127	86	100
Submetallurgical and other grade	do.	55	87	72	99	175
Total	do.	155	198	199	185	275
Gold, mine output, Au content[4]	kilograms	10,146	11,808	13,675	12,097	11,100
Gypsum[e]	thousand tons	25	25	25	25	25
Lime, hydrated and quicklime	do.	50	37	30	41	40
Molybdenum, mine output, Mo content		1,910 [e]	1,335	1,514	1,590	1,793 [3]
Petroleum, crude	thousand 42-gallon barrels	72	65	74	139	150
Salt, mine output		1,516	1,293	1,800	1,268	1,300
Silver, mine output, Ag content[e, 5]	kilograms	19,900	25,000	27,200	27,000	27,000
Steel, crude		13,100	13,000	10,000	15,900	16,000
Tungsten, mine output, W content		27	52	63	35	40

[e] Estimated; estimated data are rounded to no more than three significant digits.

[1] Table includes data available through August 25, 2004.

[2] In addition to the commodities listed, crude construction materials such as sand and gravel, and varieties of stone such as limestone and silica are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure based on 27.5% copper and 50% molybdenum content of copper and molybdenum concentrates, respectively.

[4] Reported raw gold production but excludes gold contained in copper concentrate.

[5] Based on 55 grams of silver per metric ton of copper concentrate.

Sources: National Statistical Office of Mongolia (Ulaanbaatar), Mongolian Statistical Yearbook 1999-2002. Mineral Resources Authority of Mongolia, Mining Office, Output of Mineral Commodities (Minerals Questionnaire 1999-2002).

THE MINERAL INDUSTRY OF NEW CALEDONIA

By Travis Q. Lyday

In 2003, the mineral industry of the French territory of New Caledonia continued to be dominated by the mining of nickeliferous laterite-saprolite-limonite-garnierite ores, production of ferronickel of various commercial grades, and nickel matte at the 62,000-metric-ton-per-year (t/yr)-capacity Doniambo Smelter in the harbor of Noumea, which is the territorial capital. The products of the Doniambo plant, which processed 3 million metric tons per year (Mt/yr) of nickel ore, consisted of 80% ferronickel and 20% nickel matte, which contained 75% nickel (Mining Journal Ltd., 2003). The ferronickel was used in making stainless steel. The nickel matte was shipped to Eramet SA's La Havre-Sandouville Refinery at Sandouville, which is located 15 kilometers (km) from La Havre in the north of France, for conversion into high-purity nickel metal and salts of nickel and cobalt from the intermediary nickel matte product produced at Doniambo (Resource Information Unit, 2004, p. 161; Eramet Group, 2003§[1]). The Doniambo Smelter was operated by Société le Nickel (SLN), which was a consortium of France's Eramet (60%); Société Territoriale Caledonian de Participation Industrielle (STCPI), which was a public company that represented the interests of the indigenous Kanak people of New Caledonia (30%); and Japan's Nisshin Steel Co. (10%) (Mining Journal Ltd., 2003; Resource Information Unit, 2004, p. 161). In a tie with Indonesia, New Caledonia ranked as the world's fourth ranked source of nickel ore after Russia, Australia, and Canada; the two countries also produced equal amounts of nickel ore during the year (Kuck, 2004). New Caledonia was the leading producer of ferronickel in the world (Mining Journal Ltd., 2003).

The nickel industry, which included cobalt (a byproduct of nickel mining) and ferronickel and nickel matte production from smelting, was the mainstay of New Caledonia's economy. The industry accounted for about 10% of New Caledonia's gross domestic product and contributed an estimated 80% to foreign exchange earnings in 2003. New Caledonia has about one-quarter of the world's lateritic nickel resources, or about one-sixth of the global land-based nickel resources when sulfides are included (Australian Journal of Mining, 2001).

The dominance of the nickel industry in New Caledonia notwithstanding, the territory also has six large gold prospects, all of which were purchased by Base Metals Exploration NL of Australia from Quadtel Ltd. (formerly Caledonian Pacific Minerals NL) in November 2000. By yearend 2003, Base Metals Exploration was no longer active in mining, and the sites were idle (Resource Information Unit, 2004, p. 59, 120).

On La Grand Terre, which is the main island of New Caledonia, SLN mined limonite-saprolite nickel ore from the following opencut operations: Etoile du Nord (280 km northwest of Noumea), Kouaoua (140 km north-northwest of Noumea), Népoui-Kopéto (250 km northwest of Noumea), Thio (120 km north-northwest of Noumea), and Tiebaghi (320 km northwest of Noumea).

Etoile du Nord was mined by contractors of Société Minière Georges Nontagnat on behalf of SLN. In 2003, the mine produced about 18% of SLN's total ore production for the Doniambo Smelter. The limonite was exported to Australia.

Kouaoua Mine was mined by SLN. The saprolitic ore, which averaged 2% to 3% nickel, was conveyed to coastal stockpiles by a single 11-km-long conveyor for storage; eventually, the ore was loaded by rail-mounted bucket wheel onto carriers at the offshore terminal at the rate of 1,200 metric tons per hour. All ore shipped from Kouaoua was destined for the Doniambo Smelter.

Népoui-Kopéto Mine was reopened in 1994 after its closure in 1983. In 2003, the ore was mined from the summit of the Kopeto Massif, which is located 20 km from the west coast and has an altitude of 850 to 1,000 meters (m). The ore body was saprolite with a waste-to-ore ratio of about 5 to 1. The 4 Mt/yr of material extracted was conveyed either to controlled spoil heaps, as was the case with the low nickel laterite overburden, or to the sorting plant, as was the case with the run-of-mine (ROM) ore. The lateritic ore was stored onsite. The ROM ore was screened, scrubbed, and sized onsite and then hydraulically transported via a 7-km-long pipe to the washing plant located at the foot of the Massif at an altitude of about 50 m. From the washing plant, the ore was trucked to the coast where it was stored, blended, and eventually shipped to the Doniambo Smelter. Mine output was about 830,000 t/yr of ore.

Mining began at Thio in 1880; by 1999, the mine produced about 900,000 metric tons (t) of nickel from 40 million metric tons (Mt) of saprolite. Although several sites at the Thio Mine were operated simultaneously in times past, only the Camp des Sapins and the Plateau Mines were in operation in 2003. Ore from the Plateau Mine was trucked 13 km to stockpiles. Camp des Sapins Mine is located on the right bank of the River Thio at the center of the Kopeto Massif at an altitude of 800 m and almost 50 km by road from the coast. Ore from the Camp des Sapins Mine was taken into the Thio Valley by a 7.5-km-long cableway and trucked 20 km to coastal stockpiles; eventually, the ore was loaded onto 20,000 to 25,000 t ore carriers for shipment. Combined output from the Camp des Sapins and the Plateau Mines was about 750,000 t/yr; a portion of this output was exported to Japan, and the remainder went to the Doniambo Smelter.

Tiebaghi Mine, which was the newest SLN-owned mine, may prove to be the most difficult to mine. SLN had to use explosives to break up the lateritic iron crust because the ground was too hard for direct extraction using traditional techniques and machinery. Additionally, a 30-m-thick lateritic cover and the presence of subsurface water prompted SLN to examine the introduction of dragline mining techniques. The trial dragline used a 5-cubic-meter bucket, but if the technique were to be adopted, then the production bucket would be four times larger.

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

The Tiebaghi Mine opened directly onto the Port of Paagoumene. Ore from the mine was taken to a nearby storage area by 50-t trucks and eventually transported by barge to ore carriers moored 1 nautical mile offshore. In the future, a 1.3-km-long conveyor will move the ore directly from the storage area to the ore carriers. The first ore deliveries from the Tiebaghi Mine to the Doniambo Smelter began in September 1998.

The Doniambo Smelter produced at a rate of 62,000 t/yr of nickel at the end of 2000; during that year, a feasibility study on bringing the production capacity to 75,000 t/yr by 2006 was initiated. The study was completed in early 2001, and in June, a $180 million expansion of the Doniambo Smelter was approved with some of the funding to be used to develop the Tiebaghi Mine further. The Tiebaghi ore was to be mined by using a new method developed by SLN; this method was based on systematic and accurate surveys of the deposit, computer modeling of the site, and an extraction method adapted to particularly damp ground. By October 2001, however, weakening demand for nickel had caused the smelter and the Tiebaghi mining expansion plans to be deferred.

By yearend 2003, alternative plans to extend the Tiebaghi Mine and to increase its capacity from 250,000 t/yr to more than 1 Mt/yr by 2006 were in place (Resource Information Unit, 2004, p. 61).

The Bienvenue opencut mine is located 90 km north-northwest of Noumea and was owned by JCBerton Mines (JCBM), which was based in New Caledonia. Small-scale mining of high-grade saprolitic nickel ore (3.15% nickel) has been carried out intermittently there for more than 70 years. In 1990, JCBM began mining limonite ore for export to BHP Billiton Ltd.'s Yabulu nickel refinery in Townsville, Australia. The Bienvenue deposit's limonite ore reserves were estimated in 1997 to be about 6 Mt, which would be sufficient to maintain deliveries to the Yabulu refinery at the contracted rate of 450,000 wet t/yr until at least 2008. Société Minière du Sud Pacifique S.A. (SMSP) mined saprolitic nickel ore at the Boakaine and the Kouaoua Mines to send to the Yabulu Refinery. The Boakaine Mine is located 150 km northwest of Noumea, and the Kouaoua Mine is located 140 km north-northwest of Noumea (Resource Information Unit, 2004, p. 60-61).

In 1992, Canada's Inco Limited, which was the leading nickel producer in the Western world, acquired the rights to the Goro nickel deposit in South Province at the southern tip of La Grand Terre; Inco had discovered the Goro deposit in 1969. On the basis of the extensive laterite deposits that were amenable to opencut mining, the project had the potential to have one of the lowest-cost sources of nickel in the world. A fully integrated 12-metric-ton-per-day pilot plant was constructed from modules built in Canada and assembled onsite. For assistance in providing project funding, Inco began discussions with a number of companies interested in acquiring a minority interest in the project in 2001. The French research company Bureau de Recherches Géologiques et Minières (BRGM) obtained a 15% interest, and Inco retained the remaining 85% interest.

In December 2002, Inco announced its decision to delay development of the $1.45 billion Goro project to conduct a complete project review because of higher-than-expected capital costs, which Inco announced were in the range of 30% to 45% (Resource Information Unit, 2004, p. 60).

In addition to producing abundant resources of nickel ore, the island territory also produced construction materials from several quarries, and Société des Ciments de Numbo operated a cement plant at Noumea.

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Major Source of Information

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TABLE 1
NEW CALEDONIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1999	2000	2001	2002	2003[p]
Cement		--[e]	100,000[e]	92,868	100,080[r]	100,000
Cobalt, mine output:						
Co content[e]		11,000	12,300	5,900	6,000	6,000
Recovered		1,650	1,840	885	900	900
Nickel:						
Ore:						
Gross weight	thousand tons	6,561	7,087	6,971	5,890	7,000
Ni content		110,062	123,493	58,973	59,867[r]	112,000
Metallurgical products:						
Ferronickel:						
Gross weight		158,000	157,000[e]	162,000[e]	170,000	162,000
Metal content (nickel plus cobalt)		45,289	43,914	45,912	48,650	45,900
Nickel matte:						
Gross weight		15,808	18,900[e]	19,000[e]	15,700	19,000
Metal content (nickel plus cobalt)		11,353	13,549	13,061	11,217	10,900

[e] Estimated; estimated data are rounded to no more than three significant digits. [p] Preliminary. [r] Revised. -- Zero.

[1] Table includes data available through October 1, 2004.

[2] In addition to the commodities listed, crude (unspecified) and crushed stone, construction sand, and silica sand for metallurgical use are produced, but data are insufficient to make reliable estimates of quantities.

THE MINERAL INDUSTRY OF NEW ZEALAND

By Travis Q. Lyday

In 2003, New Zealand's mining industry included a wide variety of mineral deposits. Owing to diverse geology and a dynamic tectonic history, New Zealand's economic minerals include metallic and industrial minerals and coal, natural gas, and petroleum. Although gold and silver continued to dominate the metal mining sector in 2003, coal mining and the production of a wide assortment of industrial minerals, which ranged from bentonite to zeolite, also were prominent and important for New Zealand's economy. Excluding the petroleum industry, the value of New Zealand's minerals production was estimated to be about $635 million in 2003, or less than 1% of the of the country's estimated gross domestic product of approximately $78 billion (U.S. Central Intelligence Agency, 2003§[1]). The mining industry also contributed to other sectors of the economy, such as agriculture (fertilizer), primary industry (coal and ironsand), manufacturing (industrial minerals), and transportation (road aggregate).

The main categories of New Zealand mineral production were gold and silver, industrial minerals, ironsand, and other metals. The predominant industrial minerals of New Zealand were aggregate (crushed stone and gravel), building and dimension stone, clay, diatomite, dolomite, feldspar, lime and limestone for agriculture and industrial uses, magnesite, marble, phosphate rock, salt, sulfur, and zeolite.

Government Policies and Programs

The Crown Minerals Act 1991 sets the broad legislative policy for prospecting, exploration, and mining of Crown-owned (meaning Government-owned on behalf of all New Zealanders) minerals in New Zealand. These include all in-ground gold, silver, and petroleum and approximately one-half of the in-ground coal, nonmetallic and other metallic minerals, industrial rock, and building stone. The Minister of Energy prepares and manages the Minerals Program for Minerals and the Minerals Program for Coal, which together outline the policies on which the Government bases its management decisions and the procedures and provisions that must be followed to implement the requirements of the Crown Minerals Act (Ministry of Economic Development, 2003d§).

When the Crown Minerals Act was enacted in 1991, the intention was always that existing mining licenses under the old regime would not be able to be renewed or extended. To continue mining after any current mining license expired, the holder would transfer to the new permitting system under the Crown Minerals Act. This was widely understood within the industry and was the basis upon which officials and industry proceeded from 1991 onward (NZ Mining Updates, 2003a).

The Crown Minerals Amendment Act was passed by Parliament on August 14, 2003, which strengthened the Crown Minerals Act 1991 by recognizing the original policy intention of the Crown Minerals Act as it was passed in 1991. By removing the right of mining license holders to extend or renew their licensees, the Act addresses issues that arose through recent court decisions on the transition from the repealed Mining Act 1971 and Coal Mines Act 1979 to the Crown Minerals Act 1991.

In June 2003, the Institute of Geological and Nuclear Sciences Ltd. was awarded new funding for petroleum research by the Foundation for Research, Science & Technology. The $12.6 million award was to be used within a 6-year period to quantify and characterize elements of New Zealand's petroleum systems and to identify regions with petroleum potential by improving the understanding of the geology of the country's sedimentary basins (Ministry of Economic Development, 2003p§).

The Government announced in December 2003 that it would proceed with the sale of its 11% share in the Kupe gasfield and oilfield to the state-owned electricity generator Genesis Power Ltd. to facilitate development of the field. The Government had announced its plan to make the sale to Genesis in April 2002. The sale was suspended in May, however, to enable the Government to receive and consider the Waitangi Tribunal's petroleum report, in which the claim was made that the Maori have an interest in oil and gas leases within the country; the Tribunal's report had recommended that the Government's share in Kupe be available for inclusion in Treaty settlements. The Government did not agree with the Tribunal's findings and confirmed its view that publicly owned petroleum assets were not available for use in settling Treaty of Waitangi claims. To support its conclusion, the Government cited the 1937 Oil and Petroleum Act, which essentially stated that oil and gas are completely Government issues, which means that oil and gas belong to the Government. These findings paved the way for the sale (Ministry of Economic Development, 2003b§, q§; Rigzone.com, 2003§).

Production and Trade

The Ministry of Energy announced in July 2003 that coal and gold were New Zealand's leading export-earning mineral commodities in 2002 (the latest year for which data were available); coal exports more than doubled since 1999. Cement, clay, ironsand, salt, and silver also were important contributors to the 2002 export earnings, which reached approximately $325.3 million; this was the highest amount ever and a 70% increase over the 4 years since 1998 when exports were valued at about $191.7 million. Total production of the mining industry in 2002 was about $596.7 million, which was an increase of about $153.4 million, or 35%, since 1998 (Ministry of Economic Development, 2002c§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Structure of the Mineral Industry

In addition to the numerous coal and industrial minerals operations, the petroleum wells, and a decreasing number of gold-silver mines, New Zealand had three large downstream processing plants.

New Zealand Aluminum Smelters Ltd. (NZAS) operated the Tiwai Point Smelter at Bluff near New Zealand's southernmost city of Invercargill on South Island. NZAS was owned by Comalco New Zealand Ltd. (a wholly owned subsidiary of Rio Tinto Plc of the United Kingdom) (79.36%) and Sumitomo Chemical Co. of Japan (20.64%). The smelter was commissioned in 1971 with a single reduction line following the development of the Manapouri hydroelectric scheme. Tiwai Point was chosen as the site for the smelter because aluminum smelting requires a large and very reliable power source to supply electricity continually to the reduction cells; also, because Tiwai Point was close to the deepwater Port of Bluff and the well-established infrastructure of the city of Invercargill, which would help ensure the availability of employees and general supplies.

The smelter has undergone upgrades several times; a major upgrade was made in 1996. At yearend 2003, the smelter had a carbon plant, four reduction lines, and a metal-casting facility. Capacity was 333,000 metric tons per year (t/yr), which was in the form of t-bars, extrusion billets, and ingots. More than 90% of the smelter's production was exported mainly to Japan, the Republic of Korea, and other Asian markets (Comalco Ltd., undated§). The alumina used to produce the aluminum at Tiwai Point was imported from Comalco's alumina refineries in Australia which, in turn, received their bauxite raw material from Comalco's Weipa Mine in north Queensland, Australia (Comalco Ltd., 2003§).

New Zealand Steel Ltd. (NZ Steel) (a wholly owned subsidiary of Australia's BlueScope Steel Ltd.) has operated the 700,000-metric-ton-per-year (Mt/yr), fully integrated Glenbrook steel mill at Glenbrook since 2002. Blue Scope was a former business group of BHP Billiton Pty Ltd. (BlueScope Steel Ltd., undated). The iron used by NZ Steel was in the form of titanomagnetite-rich sand derived from the coastal erosion of the Mount Taranaki volcanics. Two such ironsand mines are located in New Zealand—Taharoa and Waikato North Head. NZ Steel mined at both sites, but only the Waikato North Head material was used for the Glenbrook steelworks; the Taharoa ironsand was exported to Chinese and Japanese steel mills.

Commodity Review

Metals

Gold.—New Zealand had three major operating gold mines and one mine project in an advanced stage of development in 2003—the Grey River dredging operation on the Grey River, which was located 20 kilometers (km) northeast of Greymouth on the western coast of South Island; the Macraes opencut mine, which is located 55 km north of Dunedin in East Otago on the eastern coast of South Island; and the large Martha Hill open cut mine at Waihi, which is located 120 km southeast of Auckland at the base of the Coromandel Peninsula, North Island. The Reefton, or Globe Progress-Blackwater, was an advance project still under review at yearend 2003.

The Grey River alluvial gold dredge originally began operating in 1989, but the operation lasted only about 9 months. The dredge resumed operation in 1992 under the ownership of Birchfield Minerals Ltd., which sold some of the product as gold jewelry. In 2003, the Birchfield operation was granted a new tenement to the southwest of the original property, which was expected to extend the mine life for another 10 years (Resource Information Unit, 2004, p. 67, 123).

The Macraes Mine produced almost 5,000 kilograms (kg) of gold during 2003, which made it New Zealand's largest gold mining operation; the mine accounted for about 40% of the country's gold production. The mine also has the largest gold reserves in New Zealand (Resource Information Unit, 2004, p. 68; Ministry of Economic Development, 2002b§).

The Reefton gold project, which was owned by Australia-based GRD NL, was redesigned to be a multistage, two-mine development. The combined ore feed from the planned open pit at Globe Progress and the underground narrow-seam mine at nearby Blackwater was to be processed through a central plant facility at Globe Progress. The plant would have a combined ore output of 1.3 Mt/yr at a grade of 3.6 grams per metric ton (g/t) gold and would produce 3,700 to 4,000 kilograms per year (kg/yr) of gold.

The processing facility was to produce a high-value concentrate that would be transported to GRD's Macraes Mine for treatment though its pressure oxidation circuit. The redevelopment of the Blackwater Mine was planned as a mechanized narrow-vein mining operation that would produce approximately 1,300 kg/yr of gold at an average recovered grade of 13.0 g/t (NZ Mining Updates, 2003b).

In addition to these large gold operations, approximately 50 other small-scale gold mines operated in New Zealand in 2003 (Ministry of Economic Development, 2002a§).

Iron Ore.—Iron ore in the form of titanomagnetite-rich sand derived from the coastal erosion of volcanic rock was mined by NZ Steel from beach and dune sands and concentrated at two sites along the western coast of North Island. The Taharoa operation is located 150 km south of Auckland, and the Waikato North Head operation, 30 km south of Auckland.

The Taharoa ironsand site was leased by its Maori owners to NZ Steel beginning in 1968 until 2038. The ironsand was mined by a conventional cutter-suction dredge in dredge ponds. The heavy minerals were concentrated at the pond site by magnetic and gravity separation to produce a titanomagnetite ironsand concentrate of 57% iron. The product was pumped through twin 3-km-long slurry pipelines on to stockpiles near the ship-loading facility at the Port of Taharoa where it was exported to steel mills in China and Japan. Ironsand mining was worth about $19 million to New Zealand's economy (Ministry of Economic Development, 2003, p. 2; Resource Information Unit, 2004, p. 71).

NZ Steel had an exclusive license with the Government to mine the ironsand at its Waikato North Head site beginning in 1996 until 2096. Mining was done by two bucket-wheel excavators supported by a track-shiftable conveyor system.

Processing of the ore was by the same methods used at Taharoa, but the resulting concentrate was about 59% iron. All Waikato North Head's production was piped to NZ Steel's 450,000-t/yr integrated steel plant at Glenbrook by an 18-km-long high-pressure slurry pipeline (Resource Information Unit, 2004, p. 71).

The Glenbrook Steelworks, which specialized in flat and coated products, produced hot-rolled coils, sheet and plate for pipemaking, heavy and light engineering and barge construction materials, cold-rolled steel for tubing, and hollow sections for agricultural products, commercial construction, and reticulation.

Industrial Minerals

New Zealand has extensive industrial mineral resources that include aggregate, bentonite, a wide variety of brick clays, diatomite, dolomite, halloysite, lime and limestone, perlite, pumice, salt, high-grade silica sand, building and dimension stone, and zeolite. Industrial minerals as a group were worth $204 million to the New Zealand economy in 2003 (Ministry of Economic Development, 2003c§).

Aggregates.—New Zealand's aggregate production was about 20.5 Mt/yr; about 14.3 Mt/yr was consumed on North Island. The industry was dominated by a small number of major companies, although a large number of smaller producers supplied smaller assignments locally (Ministry of Economic Development, 2003, p. 2).

Bentonite.—Bentonite clay was mined by Omya (NZ) Ltd. in the Harper Hills volcanic terrain near Coalgate, which is located 65 km west of Christchurch, South Island. Its uses include as a binder for foundry sand, in drilling muds, and for sealing clay dams and diaphragm walls in construction projects. Production totaled about 7,000 t/yr for domestic and export markets. Marine bentonite beds also have been mined in the past at Hawk Bay on the east-central coast of North Island (Ministry of Economic Development, 2003, p. 3; Resource Information Unit, 2004, p. 62).

Cement.—New Zealand had two cement manufacturing plants that used local high-grade limestone mixed with marl for their feed. The plant located at Portland near Whangarei, was operated by Golden Bay Cement Co. Ltd. The plant's production was about 490,000 t/yr. The plant located at Cape Foulwind near Westport was operated by Milburn New Zealand Ltd. and produced about 470,000 t/yr (Ministry of Economic Development, 2003, p. 3-4).

Clays.—Kaolinite clays are used extensively for brick, ceramics, pipe, pottery manufacture, and tile. The largest brickmaking operation in New Zealand was the plant operated by CSR Building Materials (NZ) Ltd. in Auckland. Some kaolinite was also used as filler in adhesives, bitumen, and rubber. High-purity kaolinite was used by the New Zealand paper industry for paper coating and filling (Ministry of Economic Development, 2003, p. 3).

Diatomite.—Diatomite was quarried from several deposits for use as a mild abrasive, in insulation, for filtration, and as a pozzolan material used in cement. Diatom-rich lake deposits are interbedded with recent volcanic sediments in Northland, Auckland, South Auckland, and Waikato and at Rotorua, North Island. Diatomite Products Ltd. was developing the Ngakuru deposit of medium- to high-grade diatomite in the Waikite Valley, which is located 20 km south of Rotorua; production was expected to be about 20,000 cubic meters per year. At Middlemarch in Otago, diatomite lake deposits were being developed to provide high-grade filtration products. Marine diatomite deposits near Oamaru were also mined, principally for use as pet litter (Ministry of Economic Development, 2003, p. 3; Resource Information Unit, 2004, p. 65).

Dolomite.—Omya's plant at the Mount Burnett Quarry in northwest Nelson produced from 25,000 to 40,000 t/yr of dolomite, which was used as an additive to phosphatic fertilizers for spreading on magnesium-deficient soils. It was also used as aggregate and riprap, which is broken rock used to prevent erosion, such as in irrigation channels or seawalls (Ministry of Economic Development, 2003, p. 3-4).

Lime.—Limestone from Canterbury and marble from West Nelson were used by the major producer Omya for the manufacture of industrial-grade lime. Omya's main operation at Te Kuiti in South Waikato produced high-grade limestone with an output of about 50,000 t/yr. These materials were used as a filler in glass, paper, plastics, and rubber and for surface coating on paper.

Holcim (New Zealand) Ltd. (Milburn New Zealand Ltd. until September 2002) was a major producer of burnt lime through its subsidiary companies McDonalds Lime Ltd. on North Island and Taylors Lime Co. Ltd. on South Island. McDonalds quarried high-grade crystalline limestone at Otorohanga in Waikato and produced nearly 500,000 t/yr of lime products that were used in agriculture, steelmaking at the Glenbrook Mill, domestic paper pulp manufacture, gold ore processing at the Martha Hill Mine, sewage sludge and waste-water treatment, soil stabilization, and the sugar industry.

Taylors Lime, which operated a plant near Dunedin, supplied burnt lime and ground limestone mainly for use in processing gold ore at the Macraes Mine. Other uses included agriculture, sewage sludge and waste-water treatment, and soil stabilization. Additionally, the market for finely ground limestone for the glass, plastic, and rubber industries was expanding (Ministry of Economic Development, 2003, p. 4-5).

Pumice.—Pumice was quarried from very large pyroclastic deposits (rock material that was explosively ejected from a volcanic vent) in the Taupo Volcanic Zone and dredged with sands from alluvium in the Waikato River on North Island. Estimated production was 500,000 t/yr. The main uses of pumice were as fill for road construction and as sand for use in concrete block manufacture, drainage systems, and foundations. It also was used in horticultural soil mixes and exported for use in the "stone washing" of denim clothes (Ministry of Economic Development, 2003, p. 6).

Salt.—Salt was produced by solar evaporation of seawater by Dominion Salt Ltd. at Grassmere, which is located south of Blenheim, South Island. The evaporation ponds were constructed in a low-lying area close to the sea, which increased the salt concentration from 2.5% to 20%. The ponds were separated into paddocks with gates to admit and retain seawater. The saturated brine was stored in deep ponds during the winter and pumped to crystallization ponds where a salt crust of up to

0.75 meter thick would form on the bottom of the ponds. The crust was then removed by special harvesters each year in late summer. Low rainfall, high sunshine hours, and adequate wind assisted in the evaporation process; the resulting salt production was about 60,000 t/yr. Dominion Salt also owned associated refineries on the same site and at Mount Maunganui, which supplied raw solar- and vacuum-dried salt to the domestic market for agricultural and dairy usage, as edible salt, and for leather tanning and water treatment. Dominion Salt also produced pharmaceutical salt, which is manufactured to British and American Pharmacopoeia Commission standards (Ministry of Economic Development, 2003, p. 6; Dominion Salt Ltd., 2004; Resource Information Unit, 2004, p. 73).

Stone, Dimension.—Stone is widely used for decorative walls and paving. Rocks used have included basalt, dacite, granite, limestone, marble, and sandstone (Ministry of Economic Development, 2003, p. 3).

Zeolites.—NZ Natural Zeolite Ltd. mined zeolites from three quarries in the Taupo Volcanic Zone, which is located about 20 km south of Rotorua. Each quarry contained a unique zeolite. One quarry contained zeolite that absorbed odor and liquids extremely efficiently and was used in pet litter and as a granular oil/chemical and odor absorbent. Another quarry contained zeolite that had a high cation-exchange capacity and absorbed liquids and was resilient to mechanical breakdown; this zeolite was used for absorbing cations from waste water and as a base for slow-release fertilizers. Zeolite from the third quarry was used in cosmetics, as a filler, and for other specialized products. Specialized crushing and screening equipment was necessary to produce the different products (Resource Information Unit, 2004, p. 74).

Mineral Fuels

Coal.—In 2003, New Zealand produced various grades of coal from about 45 mines. Of these mines, only nine produced 100,000 t/yr or more of coal: two mines (one underground and one open cast) produced bituminous coal, and six mines (two underground and four open cast) produced subbituminous coal. In addition, a single lignite opencast operation mined at least 100,000 t/yr (Ministry of Economic Development, 2003a§).

Of the nine mines that produced 100,000 t/yr or more of coal, five were owned by Solid Energy New Zealand Ltd. (Solid Energy), which was New Zealand's leading producer and exporter of coal, and a subsidiary. Huntly East subbituminous underground mine (owned by Solid Energy) is located at Huntly, which is 94 km south of Auckland, North Island. The Rotowaro open cut sub-bituminous mine (owned by Solid Energy) is located at Rotowaro, which is 10 km south of Huntly. The Spring Creek bituminous underground mine (owned by Solid Energy subsidiary Greymouth Coal Operating Co. Ltd.) was located at Rapahoe in the Greymouth Coalfield, which is 12 km north of Greymouth, South Island. The Stockton open cut mine (owned by Solid Energy) is located on the Stockton-Denniston Plateau, which is 35 km northeast of Westport, North Island. The Wairaki No. 6 subbituminous underground mine (owned by Solid Energy) is located at Ohai, which is 77 km northwest of Invercargill (Ministry of Economic Development, 2003a§, e§, i§-k§, m§).

Two of the nine mines were owned by Glencoal Energy Ltd. The Kopako opencast subbituminous mine is located at Maramarua, which is located 70 km south of Auckland. The Renown opencast subbituminous mine is located at Rotowaro, which is 10 km south of Huntly and 104 km south of Auckland (Ministry of Economic Development, 2003f§, h§).

The remaining two of the mines are the Summit opencut subbituminous mine (owned by MacDougall Mining Co. Ltd.), which is located at Rotowaro approximately 10 km southwest of Huntly, and the New Vale lignite mine (owned by New Vale Coal Co. Ltd.), which is located in the Waimumu Coalfield approximately 60 km northeast of Invercargill (Ministry of Economic Development, 2003g§, l§).

Natural Gas and Petroleum.—Hydrocarbons are found in most New Zealand sedimentary basins that were formed during the past 100 million years, but it is only since the 1960s that hydrocarbon production has been significant in terms of New Zealand's economy and fuel needs. The Taranaki Basin has been the main focus for hydrocarbon exploration and production in New Zealand. In 2003, oil and gas was produced from nine fields in the Taranaki Basin. Another six discoveries, all of which were also in the Taranaki Basin, were under appraisal (Ministry of Economic Development, 2003n§).

All the gasfields and oilfields contained condensate, gas, and oil. About 60% of the discovered reserves were contained in the offshore Maui Field, and an additional 22%, in the offshore Kapuni Field. Both fields, however, were nearing depletion (Ministry of Economic Development, 2003o§).

About 60% of New Zealand's condensate, crude, and naphtha production was exported. The balance was used as partial feedstock for the Marsden Point Refinery near Whangarei; the remainder of the crude oil used for the refinery feed was of Middle Eastern and Far Eastern origin. Although the refinery began operating in 1964, modernization and expansion of the refinery in 1986 made New Zealand self-sufficient in all refined products. About two-thirds of the refinery's product, which included export and domestic disbursements, was distributed by sea. The remaining production traveled 170 km by pipeline to the Wiri terminal in Auckland for further distribution by tanker trucks to Auckland and nearby regions. A pipeline to distribute jet fuel ran from the Wiri terminal to Auckland International Airport.

Infrastructure

The transportation infrastructure of New Zealand was well developed. International shipping ports included Auckland, Christchurch, Dunedin, Tauranga, and Wellington. The merchant marine fleet of nine ships included one petroleum-oil-lubricant tanker. Pipelines included 2,213 km for natural gas, 304 km for refined petroleum products, 160 km for petroleum, and 79 km for liquefied petroleum gas (U.S. Central Intelligence Agency, 2003).

Outlook

Production of New Zealand's mineral wealth is expected to continue to grow as more foreign exploration companies explore the country, especially for precious metals (gold, platinum, and silver) and for hydrocarbons.

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Major Source of Information

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TABLE 1
NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001[e]	2002	2003[e]
METALS						
Aluminum metal, smelter:						
Primary		326,738	328,400	322,300 [2]	333,900 [r]	334,400 [2]
Secondary[e]		21,400	21,500	21,500	21,500	21,500
Total		348,138	349,900 [e]	343,800 [2]	355,400	355,900
Gold, mine output, Au content	kilograms	8,577	9,880	9,885 [2]	9,770 [e]	9,305 [2]
Iron and steel:						
Iron sand, titaniferous magnetite, gross weight	thousand tons	2,303	2,692	1,636 [2]	1,740	1,947 [2]
Pig iron[e]	do.	620	600	600	600	600
Steel, crude	do.	744	765	770 [2]	750 [e]	800
Lead, refinery output, secondary[e]		6,000	10,000	10,000	10,000	10,000
Silver, mine output, Ag content	kilograms	24,308	22,886	27,120 [2]	28,720	29,930 [2]
INDUSTRIAL MINERALS						
Cement, hydraulic[e]	thousand tons	960	950	950	950	950
Clays:						
Bentonite		12,300	9,800	10,000	7,800	10,940 [2]
Kaolin, pottery		16,700	16,300	15,000	17,200	14,780 [2]
For brick and tile		50,700	69,800	70,000	47,500	56,550 [2]
Diatomaceous earth		25	15	15	20	320 [2]
Lime[e]		20,000	20,000	20,000	20,000	20,000
Marble[e]		15,000	15,000	15,000	15,000	15,000
Nitrogen, N content of ammonia		110,100	105,300	116,900 [2]	109,200	110,000
Perlite[3]		1,900	2,200	2,200	7,050	5,000 [2]
Pumice		124,300	68,000	68,000	203,700	173,400 [2]
Salt[e]		65,000	60,000	70,000 [2]	70,000	70,000
Sand and gravel:						
Silica sand, glass sand		41,200	47,400	47,500	60,150	48,400 [2]
Other industrial sand		816,100	660,300	660,000	575,700	2,207,170 [2]
For roads and ballast	thousand tons	16,377	18,336	18,000	18,522	18,500
For building aggregate	do.	6,547	7,499	7,500	8,026	8,000
Stone:						
Dolomite		57,920	47,800	47,500	28,400	21,920 [2]
Limestone and marl:						
For agriculture	thousand tons	1,993	2,029	2,000	2,732	2,553 [2]
For cement	do.	1,582	1,603	1,600	1,697	1,652 [2]
For other industrial uses	do.	482	527	500	865	672 [2]
For roads[e, 4]	do.	20,000	20,000	20,000	20,000 [r]	20,520 [2]
Serpentine		91,400	51,500	51,500	61,300	68,960 [2]
Dimension		20,600	28,700	29,000	30,200	37,300 [2]
Rock for harbor work[e]	thousand tons	1,500	1,500	1,500	1,500	1,500
MINERAL FUELS AND RELATED MATERIALS						
Carbon dioxide, liquefied[e]		10,000	10,000	10,000	10,000	10,000
Coal, all grades	thousand tons	3,505	3,586	3,911 [2]	4,459	5,180 [2]
Gas:[e]						
Manufactured, from gasworks	thousand cubic meters	11,000	11,000	11,000	11,000	11,000
Natural:						
Gross production	million cubic meters	5,600 [r]	5,700 [r]	5,750 [r]	5,780 [r]	5,800
Marketed production	do.	4,050	4,100	4,500	5,000	5,000
Natural gas liquids:[e]						
Liquefied petroleum gas	thousand 42-gallon barrels	2,000	2,000	2,000	2,100	2,200
Natural gasoline	do.	700	700	700	750	800
Total	do.	2,700	2,700	2,700	2,850	2,900
Peat	cubic meters	89,500	97,200	95,000	90,000	90,000

See footnotes at end of table.

TABLE 1--Continued
NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001[e]	2002	2003 [e]
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude[e]	thousand 42-gallon barrels	14,960	13,160 [r]	12,400 [r]	11,700 [r]	8,711 [2]
Refinery products:						
Gasoline	do.	8,500	8,500	9,000	9,000	9,000
Distillate fuel oil	do.	13,000	13,000	14,000	14,000	14,000
Residual fuel oil	do.	3,500	3,500	4,000	4,000	4,000
Other	do.	3,500	3,500	4,000	4,000	4,000
Refinery fuel and losses[e]	do.	2,000	2,000	3,000	3,000	3,000
Total	do.	30,500	30,500	34,000	34,000	34,000

[e] Estimated. [r] Revised.

[1] Table includes data available through October 1, 2004.

[2] Reported figure.

[3] Includes zeolite.

[4] Includes dolomite.

THE MINERAL INDUSTRY OF PAKISTAN

By Travis Q. Lyday

The Islamic Republic of Pakistan is located in southern Asia in the northwestern corner of the Indian subcontinent. It borders the countries of India to the east, China to the northeast, Afghanistan to the north and west, and Iran to the southwest. The Arabian Sea along the south forms a 1,046-kilometer coastline. Its total area of 803,940 square kilometers is slightly less than twice the size of California.

Mining and quarrying products, which included natural gas, and petroleum played a minor role in the economy of Pakistan; they accounted for less than 1% of the gross domestic product. The country also produced a variety of minerals, of which the more important included barite, chromite, coal, dolomite, gypsum, limestone, magnetite, natural gas, petroleum, salt, and sulfur. Additionally, various regional geologic surveys substantiated the potential of such metals as copper, gold, iron ore, lead, platinum, silver, and zinc and such industrial minerals and rocks as multicolored granite, marble, and other dimension stones of high quality.

More-extensive coverage of the mineral industry of Pakistan can be found in the 2002 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Asia and the Pacific.

TABLE 1
PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001[e]	2002[e]	2003[e]
METALS						
Aluminum, bauxite, gross weight		11,216	8,668	9,000	9,500	9,600
Chromium ore:						
Gross weight		16,279	26,844	26,000	27,200	27,500
Cr_2O_3 content		7,325	12,080	12,000	12,500	13,000
Iron and steel:						
Pig iron[e]	thousand tons	1,500	1,500	1,500	1,600	1,600
Steel, crude[e]	do.	500	500	500	550	550
Lead, refined, secondary[e]		2,000	2,000	2,000	2,100	2,330
INDUSTRIAL MINERALS						
Abrasives, natural, emery[e]		150	120 [2]	150	150	150
Barite		20,505	21,234	25,000	26,100	27,100
Cement, hydraulic[e]	thousand tons	9,600	9,900	9,900	10,300	10,300
Chalk		6,283	7,711	7,700	8,000	8,000
Clays:						
Bentonite		15,349	27,700	28,000	29,200	30,000
Fire clay		152,379	143,643	145,000	151,500 [2]	160,000
Fuller's earth		15,565	15,288	15,000	15,700	16,000
Kaolin, china clay		64,692	49,574	50,000	52,000	52,000
Other[e]		200,000	200,000	200,000	209,000	210,000
Feldspar		29,235	43,186	45,000	47,000	47,000
Fluorspar		220	997	1,000	1,000	1,000
Gypsum, crude		244,538	377,000	380,000	397,000	397,000
Magnesite, crude		2,175	4,192	4,200	4,400	4,500
Nitrogen, N content of ammonia		1,998,900	1,884,300	1,966,100 [2]	2,050,000	2,050,000

See footnotes at end of table.

TABLE 1--Continued
PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001[e]	2002[e]	2003[e]
INDUSTRIAL MINERALS--Continued						
Phosphate rock:[e]						
Gross weight		11,500	11,000	11,000	11,500	11,500
P_2O_5 content		1,950	2,000	2,000	2,100	2,000
Pigments, mineral, natural, ocher		3,200 [e]	4,747	4,800	5,000	5,000
Salt:						
Rock	thousand tons	1,019	1,313	1,500	1,600	1,700
Marine	do.	16	20	20	21	23
Total	do.	1,035	1,333	1,520	1,590	1,600
Sand:[e]						
Bajir and common		175,000	212,120 [2]	215,000	225,000	225,000
Glass		130,000	162,000 [2]	165,000	172,000	175,000
Sodium compounds, n.e.s.:[e]						
Caustic soda		220,000	220,000	220,000	230,000	230,000
Soda ash, manufactured		230,000	230,000	230,000	240,000	240,000
Stone:						
Aragonite and marble		391,754	582,000	585,000	611,000	610,000
Dolomite		188,573	287,962	290,000	303,000	303,000
Limestone	thousand tons	9,437	9,884	9,900	10,300	12,000
Other, as "ordinary stone"[e]	do.	18	20	20	21	22
Strontium minerals, celestite		634	1,918	2,000	3,000	3,000
Sulfur:						
Native[e]		150	150	200	210	215
Byproduct, all sources		21,166	20,189	21,000	21,900	22,000
Total		21,316	20,339	21,200	22,110 [r, 2]	22,215 [2]
Talc and related materials, soapstone		67,670	54,365	55,000	57,500	58,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand tons	3,461	3,116	3,500	3,700	3,800
Coke[e]	do.	900	900	900	950	1,000
Gas, natural:						
Gross production	million cubic meters	8,876	24,222	25,000	26,000	26,000
Marketed production, sales[e]	do.	7,700	20,900	21,000	22,000	22,000
Natural gas liquids[e]	thousand 42-gallon barrels	564	600	600	650	650
Petroleum:						
Crude	do.	19,986	20,450	22,000	23,000	24,000
Refinery products:[e]						
Gasoline	do.	8,589 [2]	8,500	8,700	9,000	9,000
Jet fuel	do.	5,255 [2]	5,500	5,700	6,000	6,000
Kerosene	do.	2,714 [2]	2,700	3,000	3,100	3,100
Distillate fuel oil	do.	14,000	14,000	15,000	15,700	15,700
Residual fuel oil	do.	13,500	13,500	15,000	15,500	15,500
Lubricants	do.	1,500	1,500	2,000	2,100	2,100
Other	do.	5,000	5,000	7,000	7,300	7,300
Total	do.	50,600	50,700	56,400	58,700	58,700

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Table includes data available through October 1, 2004.

[2] Reported figure.

THE MINERAL INDUSTRY OF PAPUA NEW GUINEA

By Travis Q. Lyday

Papua New Guinea comprises the eastern one-half of the island of New Guinea (which is the second largest island in the world), an archipelago of an additional three islands (Bougainville, New Britain, and New Ireland), and about 600 smaller islets, atolls, and coral reefs. The 463,000-square-kilometer (km^2) nation, which includes 9,980 km^2 of territorial waters, is located east of Indonesia between the Coral Sea and the South Pacific Ocean and lies just north of the Australian continent. Papua New Guinea was formed by the merger of the Australian territory of Papua and the German colonial possession of New Guinea following World War I. Australia administered Papua New Guinea until 1975 when it became an independent state.

Historically, mining has played a prominent role in Papua New Guinea's economy. In 1888, the first significant discovery of gold was made when the search for new bonanza alluvial gold deposits brought Australian miners from Queensland to Sudest Island in the Louisiade Archipelago. This discovery was followed by gold rushes at Misima and Woodlark Islands in the Solomon Sea and then on the mainland, which culminated in discoveries at Wau in 1922 and the adjacent Edie Creek in 1926. Hardrock mines were established on Misima, Sudest, and Woodlark Islands when the alluvial gold was exhausted; of the three, however, gold mining continued only at Misima following World War I. The rich discoveries at Edie Creek lead to the establishment of a number of underground hardrock mines near there and at nearby Wau and large-scale dredging operations in the Bulolo Valley, which started in 1932. By 1939, eight large dredges were operating in the Wau-Bulolo Valley and, except for the interruption during World War II, dredging continued until 1965 when the last dredge was abandoned. Spurred by the fabulous riches of Edie Creek, prospectors ventured into other parts of the mainland and the outer islands; they eventually mined gold at Kainantu, Mount Hagen, and Porgera in the Highlands, along the Sepik River in the north, and at Kupei on Bougainville Island (Papua New Guinea Chamber of Mines and Petroleum, 2000, p. 9).

Petroleum exploration also is not new to Papua New Guinea. Oil companies have been searching diligently for recoverable oil and gas reserves since the first reports of oil seeps near Kerema along the coast of the Gulf of Papua in 1911. Although first oil was not discovered until 1922, 94 exploratory wells had been drilled by the time of independence in 1975.

More-extensive coverage of the mineral industry of Papua New Guinea can be found in the 2002 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Asia and the Pacific.

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TABLE 1
PAPUA NEW GUINEA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1999	2000	2001	2002	2003[e]
Copper, mine output, Cu content	metric tons	187,921	203,061	203,762	204,000	204,000
Gas, natural	million cubic meters	1,353	1,438	1,434	1,450[e]	1,450
Gold, mine output, Au content	kilograms	65,747	74,540	67,043	70,000	70,000
Natural gas liquids	42-gallon barrels	105,460	224,857	186,190	200,000[e]	200,000
Petroleum, crude	thousand 42-gallon barrels	32,020	24,967	20,423	20,000[e]	20,000
Silver, mine output, Ag content	kilograms	66,542	79,197	69,368	73,000	73,000

[e] Estimated; estimated data are rounded to no more than three significant digits.

[1] Includes data available through October 1, 2004.

[2] In addition to the commodities listed, cement and crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates.

THE MINERAL INDUSTRY OF THE PHILIPPINES

By Travis Q. Lyday

The Republic of the Philippines, which is a developing democratic republic, is located just north of the equator about 1,100 kilometers (km) east of the coast of the mainland of Southeast Asia. The country is an archipelago that comprises 7,000 islands, of which fewer than 900 are inhabited by the country's 85 million people; the major islands are Luzon in the north, Visayas in the middle, and Mindanao in the south. The archipelago is within the Pacific "Rim of Fire," which is so-called because of the intense volcanic activity at the margins of the tectonic plates, and is well-known for its epithermal gold, porphyry copper-gold, and volcanic-hosted massive sulfide deposits.

In 2003, the Philippines was a significant producer of chromite, copper, gold, and nickel and had in the recent past ranked among the world's top 10 producers. Other important mineral commodities were coal, gypsum, silver, and sulfur. Significant deposits of clay, limestone, marble, phosphate, and silica also occur.

More-extensive coverage of the mineral industry of the Philippines can be found in the 2002 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Asia and the Pacific.

TABLE 1
PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1999	2000	2001[e]	2002[e]	2003[e]
METALS						
Chromium, chromite, gross weight		19,566	861	1,932 [3]	2,000	2,600
Copper:						
Mine output, Cu content		34,600	129,768	20,322 [3]	18,364 [3]	20,414 [3]
Metal:						
Smelter		162,000	160,000	216,634 [r, 3]	137,800 [r, 3]	111,600 [3]
Refined		147,982	150,000	164,530 [r, 3]	144,315 [r, 3]	171,152 [3]
Gold, mine output, Au content	kilograms	31,050	36,540	33,840 [3]	35,850 [3]	37,840 [3]
Iron and steel, steel, crude	thousand tons	530	530	530 [3]	530	550
Lead, metal, secondary refined		12,389	16,218	24,000	24,000	24,000
Nickel, mine output, Ni content		20,689	17,388	23,100 [r, 3]	24,148 [r, 3]	27,000 [3]
Silver, mine output, Ag content	kilograms	18,210	23,534	33,600	8,800	9,580 [3]
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	12,566	11,959	8,653 [3]	9,000	8,500
Clays:						
Bentonite		1,844	2,800	5,128 [3]	5,500	5,500
Red		--	-- [e]	4,983 [3]	5,000	5,000
White		5,465	1,598	5,111 [3]	5,000	5,000
Other		--	771	800	800	800
Feldspar		16,909	3,440	33,122 [3]	30,000	30,000
Lime		7,829	9,000	9,000	9,000	9,000
Perlite		10,265	5,650	6,000	6,000	6,000
Phosphate rock	thousand tons	181,000	434,000	450,000	400,000	400,000
Pyrite and pyrrhotite, including cuprous, gross weight[e]		320,000	300,000	300,000	300,000	300,000
Salt, marine		704,347	589,528	600,000	600,000	429,160 [3]
Sand and gravel:						
Silica sand	thousand tons	64	70	70	70	70 [3]
Other[e, 3]	thousand cubic meters	15,000	15,000	15,000	15,000	15,000
Stone:						
Dolomite		839,102	823,302	802,189 [3]	800,000	750,000
Limestone[4]	thousand tons	16,738	22,244	23,000	20,000	16,432 [3]
Marble, dimension, unfinished	cubic meters	9,826	14,804	15,000	15,000	15,000
Volcanic cinder[e]	do.	2,000	2,000	2,000	2,000	2,000
Tuff		1,460	1,662	1,500	1,500	1,500
Quartz[e]		50,000	50,000	50,000	50,000	50,000
Crushed, broken, other[5]	thousand cubic meters	2,388	2,684	2,500	2,500	2,500
Sulfur, all forms[e]		133,000 [3]	134,000 [3]	170,000	180,000	180,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand tons	1,205	1,218	1,230 [3]	1,665 [3]	2,029 [3]
Petroleum:						
Crude	thousand 42-gallon barrels	400	400 [e]	475 [3]	2,020 [3]	2,000
Refinery products:[e]						
Liquefied petroleum gas	do.	5,500	5,500	6,000	25,200	25,200
Gasoline	do.	18,500	18,500	19,000	79,800	79,800
Jet fuel	do.	6,500	6,500	7,000	29,400	29,400
Kerosene	do.	4,500	4,500	5,000	21,000	21,000
Distillate fuel oil	do.	40,000	40,000	40,000	168,000	168,000
Residual fuel oil	do.	47,000	47,000	47,000	215,000	215,000
Refinery fuel and losses	do.	5,000	5,000	5,000	230,000	230,000
Other	do.	10,000	10,000	10,000	225,000	225,000
Total	do.	137,000	137,000	139,000	993,400 [3]	993,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data through October 1, 2004.

[2] Reported.

[3] Included "pebbles" and "soil" not further described.

[4] Excluded limestone for road construction.

[5] Included materials described as rock, crushed or broken; stones, cobbles, and boulders; rock aggregates; and broken adobe.

THE MINERAL INDUSTRY OF SINGAPORE

By Pui-Kwan Tse

Singapore, which is known as the "Lion City," has been transformed from an impoverished island in Southeast Asia with no natural resources into one of the richest economies in Asia and the Pacific region. The city-state sees itself as the place where Asia and the West meet. It is located at the entrance to the Strait of Malacca, which has become one of the most important transshipping centers in the world. Singapore also is a leader in the development of new biotechnologies, the manufacturing of electronic components, and petroleum refining.

Since its independence from Malaysia in 1965, Singapore has invested heavily in its people to keep its economy competitive and prosperous. Considered to be a politically stable and well-regulated place to do business, Singapore is consistently rated as having one of the best environments for investment in the world. After the country experienced a sharp economic downturn in 2001, its gross domestic product grew by 2.2% in 2002 and 1.1% in 2003. An outbreak of Severe Acute Respiratory Syndrome (SARS) in the first half of 2003 kept foreign visitors away; this severely affected the tourism and travel-related industries, which included airlines, hotels, retail outlets, and restaurants. Economic growth for the year was mainly the result of a modest recovery in the global electronics market; electronics exports accounted for about 40% of Singapore's total trade. The construction sector declined for the fifth consecutive year, and public and private construction activities remained weak. The decline in construction largely resulted from weak demand for commercial and industrial projects. Cement production in Singapore ceased in early 2002, and all supplies were imported. In 2003, the financial services sector grew by 3.7% compared with a decrease of 6.3% in 2002 because of the economic recovery in the domestic and regional economies in the second half of the year. Owing to the contraction in the construction sector and the growth of labor productivity, the average unemployment rate rose to 4.7% in 2003 compared with 4.4% in 2002 (Singapore Department of Statistics, 2004, p. 109).

In late 2001, the Government established the Economic Review Committee to put into practice a strategy to restructure the country's economy. The Committee recommended that the Government encourage the private sector to develop new business ideas and provide equal opportunities for all enterprises. It also recommended that the Government enact a law to regulate competition and to establish an independent agency to oversee the competitions within the next 2 to 3 years. The Committee urged Temasek Holdings, which the Government formed in 1974 to oversee its investments, to provide opportunities for Government-linked companies (GLCs) to become globally competitive and to sustain their development. Although Temasek was not involved in the daily operations of the GLCs, it supervised key appointments and had strategic authority.

In 2003, the Government enacted two off-budget packages to help Singaporeans and businesses cope with the economic downturn caused by the SARS outbreak. In fiscal year 2004, the corporate income tax rate could be reduced to 20% from 22%, and tax exemptions could be granted for newly incorporated companies and foreign-sourced income. To enhance Singapore's ability to compete globally, the Government signed bilateral and multilateral trade agreements with countries in Asia and the Pacific region that would link Singapore's economy closely to global economic networks. Singapore's economy has been transformed from one based on low-technology manufacturing to one based on highly skilled commercial activities (Economic Survey of Singapore, 2002, p. 76-94).

NatSteel Ltd., which was the largest steel company in Singapore, decided to dispose of its entire equity stakes in National Cement Industry Pte Ltd. and Yangtze Cement Holdings Pte Ltd. to focus on its core business. The company had a design output capacity of 600,000 metric tons (t) of crude steel from its 80-t electric-arc furnace. Owing to the decline in the construction sector and the increase in production costs in Singapore, NatSteel planned to expand its steelmaking operations in China and other Southeast Asian countries.

Singapore has developed into a major hub for the international chemical sector. Chemicals, petroleum, and petroleum products were Singapore's leading exports after electronics. In 2003, the export value of petroleum and petroleum products totaled more than $16 billion, which was about 11% of the total value of exports. The Government planned to increase the output share of the petrochemical products in the manufacturing industry to 30% in 2010 compared with 25% in 2003. Petroleum refining accounted for 57% of the chemical sector's production. The oil refiners Exxon Mobil Corp., Royal Dutch/Shell Co., Singapore Petroleum Co., and Singapore Refinery Co. had a combined output capacity of about 1.3 million barrels per day. Major multinational petrochemical companies, such as BASF, ChevronTexaco Corporation, ExxonMobil, Mitsui Chemical Co., Royal Dutch/Shell, and Sumitomo Chemical Co., had set up plants on the island.

Singapore's Economic Development Board, which had overseen the development of the Jurong Island project to attract more investment to the country, established the Chemical Process Technology Center to provide on-the-job training for chemical workers. The primary goal was to train a high-quality labor force for the chemical sector. In 2003, the chemical sector accounted for 20% of total manufacturing fixed asset investment commitments. Most chemical products were for export, although some were used as critical raw materials for the electronics sector in Singapore (Asian Chemical News, 2004).

The Government planned to develop Singapore as an international center for the biomedical sciences industry, with expertise in such highly skilled activities as basic research, product discovery and development, clinical research, and high-technology manufacturing. About $500 million of fixed asset investments had been committed through 19 projects. Multinational biomedical companies, such as Baxter Co., Eli Lilly and Co., Merck Sharp & Dohme Ltd., and Novartis AG, had established research centers and manufacturing plants in Singapore (Washington Times, The, 2002).

Over time, the mineral industry is expected to become less important to the Singapore economy. Singapore, however, will continue to be a leader in the development of new biotechnologies and the manufacturing of electronic components.

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Major Sources of Information

Economic Development Board
250 North Bridge Road
#24-00 Raffles City Tower
Singapore 179101
Ministry of the Environment
Environment Building
40 Scotts Road
Singapore 228231
Ministry of Trade and Industry
100 High Street
#09-01 The Treasury
Singapore 179434
Singapore Trade Development Board
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#07-00 Bugis Junction Office Tower
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THE MINERAL INDUSTRY OF SRI LANKA

By Chin S. Kuo

Sri Lanka's economy performed strongly in 2003 with a growth of 5.5% in the gross domestic product (GDP). Expansion in the manufacturing sector, telecommunications, tourism, and trade, and a record harvest of rice crops contributed to the increase. The service sector accounted for 54% of the GDP; agriculture, 20.1%; manufacturing, 16%; construction, 7.4%; and mining and quarrying, 1.8%. Owing to the Government's program of privatization and deregulation, the country received $300 million in foreign investment, which was an increase of 24% compared with that of 2002. Countries that invested in Sri Lanka included Australia, India, Malaysia and other Southeast Asian countries, and the United States. Indian companies showed interest in Sri Lanka's potential as a manufacturing base and as a new source of manpower (Far Eastern Economic Review, 2003).

Sri Lanka is endowed with industrial mineral resources that include apatite, calçite, clay, dolomite, feldspar, graphite, ilmenite, kaolin, mica, quartz, rutile, silica sand, and zircon. Graphite and mineral sands (mostly monazite) were mainly exported. The country also exported geuda (pale white or colorless sapphire), loose gemstones, and jewelry. The Government owned apatite, graphite, and mineral sand mines; the remainder of the country's mines were owned and operated by the private sector. The country had almost no metal or mineral fuel resources.

The Geological Survey and Mines Bureau was responsible for identifying and assessing the country's mineral resources; undertaking systematic geologic mapping; evaluating the commercial viability of mining, processing, and exporting minerals; and regulating the mineral industry through the issuance or withdrawal of licenses.

The Government initiated a project to encourage expansion in the gemstone industry by opening up new lands in central Sri Lanka to sapphire mining. Traditional mining fields were located 100 kilometers southeast of Colombo in the area of Ratnapura. The plantation owners allowed the Government to manage their lands and to auction the mining rights leases for 1 year. In exchange, the plantation owners received 40% of the auction proceeds and 50% of the declared profits from the sale of gems mined on their lands. Miners looked for alluvial gravel; if nothing was found or a pit mine stopped producing gem-bearing gravel, the miners were responsible for recovering and replanting the disturbed areas.

In addition to opening up new areas for mining, the Government and the gemstone industry sought to encourage experimentation in heat-treatment technology as part of the industry's 5-year growth plan. In the heat-treatment process, pale white or colorless sapphires are heated to a fine blue color before being cut and polished. Cutters and polishers concentrated on the bigger single stones of 3 carats or more and preferred the local gems. As a result of these new initiatives, Sri Lanka's total production of sapphire was up by 124% in 2003. The gemstone industry employed 400,000 to 500,000 people (Colored Stone, 2003).

The ceramics industry was the largest mineral-based sector in Sri Lanka. The country had substantial deposits of alluvial clay, ball clay, bloating clay, china clay, clay ochre, kaolin, nonbauxite clay, and shale. The Government sought to exploit the export market for ceramics used in electronic goods and roof tiles and to achieve an annual growth rate of 5% for the industry. To boost clay production and identify additional clay reserves, the industry hoped to locate new good-quality feldspar and kaolin deposits. No new ball clay deposits had been identified in the recent past. Clay reserves that were being mined at Boralesgamuwa and Meetiyagoda were expected to run out during the next 2 to 3 years. Reserves of quartz were estimated to be adequate at more than 20 million metric tons (Industrial Minerals, 2003).

The Parliament approved the Petroleum Resources Bill, which allowed the private sector to invest in oil and gas exploration, to exploit petroleum resources, and to share profits with foreign and local companies. A committee will be established to issue licenses to prospective investors for exploration and recovery of oil and gas (Rigzone.com, 2003§[1]).

Sri Lanka imported all its oil requirements; some of the oil was refined by state-run Ceylon Petroleum Corp. (Ceypetco), which had a refining capacity of 50,000 barrels per day. The country imported 15.4 million barrels (Mbbl) of crude oil and 14.3 Mbbl of petroleum products in 2003. The Government looked for an oil company to operate 100 gas stations; this company would share the market with Indian Oil Corp. (IOC) and Ceypetco. PetroChina Company Limited, Petroiam Nasional Berhad of Malaysia, and four Indian oil companies showed interest. The Government selected IOC, and the company took over the 100 gas stations for $62 million early in 2003 (World Refining, 2003).

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Ceylon Petroleum Corp.
P.O. Box 634
113 Galle Road
Colombo 3, Sri Lanka
Geological Survey and Mines Bureau
4 Galle Road
Dehiwala, Sri Lanka
Lanka Ceramic Ltd.
Colombo, Sri Lanka
State Gem Corp.
Colombo, Sri Lanka
State Mining and Mineral Development Corp.
Colombo, Sri Lanka

TABLE 1
SRI LANKA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		1999	2000	2001	2002	2003
Cement, hydraulic	thousand tons	976	1,008	1,108	1,018	1,164
Clays:						
Ball clay		26,678	27,525	24,846	28,431	33,405
Kaolin		12,573	12,230	9,403	8,613	9,073
Brick and tile clay[e]		8,100	8,100	8,000	8,000	8,000
Clays for cement manufacture[e]		750	800	850	850	900
Feldspar, crude and ground		26,012	28,638	27,438	28,866	32,586
Gemstones, precious and semiprecious, other than diamond:	value, thousands	$33,217	$71,774	$57,530	$54,604	$96,797
Cat's eye	carats	48,384	48,000	NA	36,891 [r]	45,228
Ruby	do.	11,300	15,800	NA	23,000 [r]	12,934
Star ruby	do.	11,600	5,400	NA	NA	NA
Sapphire	do.	155,400	173,700	NA	344,900 [r]	773,547
Star sapphire	do.	298,400	280,500	NA	NA	NA
Other	do.	12,429,800	6,426,300	NA	4,110,400 [r]	1,828,400
Graphite, all grades		4,592	5,902	6,585	3,619	3,387
Iron and steel, metal, semimanufactures[e]		54,000	54,000	51,000	50,000	50,000
Mica, scrap		1,425	1,491	1,161	1,161	1,174
Petroleum refinery products:[e]						
Gasoline	thousand 42-gallon barrels	1,950	2,000	2,000	2,100	2,100
Jet fuel	do.	500	550	600	600	650
Kerosene	do.	1,500	1,550	1,500	1,500	1,500
Distillate fuel oil	do.	4,600	4,700	4,800	4,900	5,000
Residual fuel oil	do.	5,300	5,300	5,200	5,200	5,200
Refinery fuel and losses	do.	720	700	680	700	710
Other	do.	1,900	1,950	2,000	2,000	2,050
Total	do.	16,500	16,800	16,800	17,000	17,200
Phosphate rock, gross weight		31,990	34,443	35,440	38,775	41,357
Rare-earth metals, monazite concentrate, gross weight[e]		200	--	--	--	--
Salt		107,245	70,107	130,272	73,274 [r]	78,713
Stone:						
Limestone	thousand tons	683	682	819	848	991
Quartz, massive		14,553	13,236	15,731	7,857	18,139

[e] Estimated. [r] Revised. NA Not available. -- Zero.

[1] Table includes data available through September 16, 2004.

[2] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[3] In addition to the commodities listed, crude construction materials, such as sand and gravel, and varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

THE MINERAL INDUSTRY OF TAIWAN

By Pui-Kwan Tse

Despite the outbreak of Severe Acute Respiratory Syndrome (SARS) in the second quarter of 2003, Taiwan's economy recovered in the second half and posted a positive rate of growth for the year. The island's gross domestic product posted a gain of 3.2% to New Taiwan (NT) $10.2 trillion ($307 billion). Much of the recovery was contributed by the increase of exports and the expansion in the manufacturing sector especially in electronics and information technology products. The Taiwan Institute of Economic Research predicted that Taiwan's economy would grow by 5% in 2004 partly in response to the rebound of the Japanese and the U.S. economies in late 2003 (Ministry of Economic Affairs, 2004, p. 3).

With limited mineral resources, Taiwan imported various minerals to meet its increasing demand. In 2003, the production index for fuel and nonmetallic mining sectors decreased by 4.8% and 22.2%, respectively, compared with those of 2002. Mining accounted for only 0.1% of total industrial production output value. The manufacturing output value of fuel, industrial minerals, and metals accounted for 22.0% of the total. Iron and steel was the leading metal production sector on the island. Other value-added manufacturing products, such as aluminum and copper, depended upon imported metals and scrap (Ministry of Economic Affairs, 2004, p. 5).

In the past several years, labor-intensive industries have been relocated to China, which prompted the Taiwan authorities and the local business community to develop high-technology and service-oriented industries. The transition has resulted in a higher unemployment rate as older industries moved away, and policymakers were required to mitigate the social and economic impacts of lost low-end jobs. The Council for Economic Planning and Development planned to invest $8.6 billion to expand public construction projects, such as the Suao-Hualien Freeway and Kaohsiung mass transit system, and also initiated a plan through Government subsidies for investment and loan guarantees for the private sector to spend $8.6 billion in free-trade zones during the next 3 years. The Ministry of Economic Affairs completed feasibility studies, and the Legislative Yuan approved the development of the Changpin Industrial Zone in central Taiwan, Heping Port in Hualien, Kuangtang Port in Taoyuan County, and Mailiao Port in Yunlin County (Taiwan Headlines, 2003a§[1]).

In 2003, the Taiwan authorities continued their efforts to restructure the island's financial institutions and established 16 asset management companies to assist the authorities in dealing with nonperforming loans and to restore the health of the troubled banking sector. The goal for the Ministry of Finance (MOF) was to lower the nonperforming loan ratio to less than 5% ($4.79 billion) in 2004 (Taiwan Headlines, 2004§). The MOF planned to consolidate the island's 51 banks into several larger banks. The three largest banks—the Bank of Taiwan, the Taiwan Cooperative Bank, and the Land Bank of Taiwan—had a combined 26% of the market share. The MOF also intended to privatize three state-owned banks—the Bank of Taiwan, the Land Bank of Taiwan, and the Central Trust of China—in 2006 (Taipei Times, 2003§). On December 31, 2003, amendments to the 1920 Mining Law took effect immediately.

The Legislative Yuan passed the Financial Institution Merger Law and Financial Holding Company Law in 2001 to allow financial institutions to have the flexibility to merge and to provide a wider range of financial services. It also passed the Financial Assets Securitization Statute in 2002. These new laws allowed companies greater flexibility in raising capital, strengthened shareholder protection, and encouraged business consolidations. A new agency, the Financial Supervisory and Management Committee, will be established on July 1, 2004, to oversee banks, securities, futures houses, and insurance companies. The Central Bank of China will retain the power to monitor financial activities related to monetary policy (China Post, 2004§).

In 2003, Taiwan's total trade increased by 11.1% to $273.6 billion. Values of exports and imports increased to $145.1 billion and $128.5 billion, respectively. Crude oil remained the leading imported commodity by value and was followed by coal, natural gas, iron ore, marble, and kaolin. Taiwan's largest exports were products of capital and technology-intensive sectors, such as electrical equipment, base-metal products, precision instruments, and musical instruments. Traditional labor-intensive products, such as cement, footwear, and textiles, had decreased significantly in the past decade in terms of export value and proportion of total exports. In 2003, China replaced the United States as Taiwan's leading trading partner. The total trade with China was $46.3 billion followed by the United States with $44.6 billion and Japan with $42.8 billion (Ministry of Finance, 2003a, b).

Without any primary aluminum production on the island, aluminum product producers depended on imports of aluminum ingot and scrap to meet their needs. In 2003, the island produced 184,043 metric tons (t) of aluminum alloy products; this was a decline of about 59% compared with that of 1997. Owing to high production costs and a shortage of raw materials during the past several years, many aluminum producers either closed down their operations or moved their production facilities to China. Taiwan consumed about 600,000 metric tons per year of aluminum (Ministry of Economic Affairs, 2004, p. 133).

Despite the sluggish demand in the public and private construction sectors and the outbreak of SARS in 2003, cement production decreased slightly. Because of the increased demand for cement in China and the Southeast Asian countries, the prices of imported and domestic cement increased. Several public construction projects, which included mass railway transit projects, the CKS International Airport, and the Suao-Hualien Freeway, were postponed. Cement inventory in producers' warehouses reached an alltime high. In 2003, Taiwan consumed less than 16 million metric tons (Mt) of cement; this number was expected to increase only slightly in 2004 (Building Materials Industry Information, 2004; Ministry of Economic Affairs, 2004, p. 126).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

The Taiwan authorities relaxed existing regulations to allow sand and gravel extraction in southern Taiwan. During the past 5 years, domestic demand for sand and gravel reached about 66 million cubic meters per year. About 40% was extracted from rivers, 15% was imported from China, and the remainder was recycled from discarded building materials. The consumption of sand and gravel was expected to increase if all public projects proceeded as scheduled in 2004. Hualien County, which is located in the eastern part of the island, could supply about 50 million cubic meters per year of sand and gravel, but transportation costs from Hualien to Kaohsiung were high. Increased mining in Hualien also created environmental problems in that area. The reopening of sand and gravel extraction operations in southern Taiwan could provide an additional 22 million cubic meters of raw material for the construction sector (Taiwan Headlines, 2003c§).

Shareholders of Southeast Cement Corp. approved the company's participation in the Chia Hsin Cement Corp. expansion project in China. Chia Hsin planned to invest $100 million to build a second kiln at its subsidiary Jing Yang Cement Co. in Jiangsu Province, China. After completion in 2006, Jing Yang will have a cement output capacity of 6 million metric tons per year (Mt/yr). Southeast was the fifth cement producer in Taiwan to invest in cement production in China following Chia Hsin, Asia Cement Corp., Taiwan Cement Corp., and Universal Cement Corp. (International Cement Review, 2003).

Taiwan's leading cement producer Asia Cement Corp. planned to invest $607 million to expand its cement production facilities in China. The company intended to construct two cement plants in the Provinces of Hubei and Sichuan and to add two more kilns to its cement plant in Nanchang, Jiangxi Province. The total company output capacity was expected to reach 20 Mt in 2010 (10 Mt each in China and Taiwan) (International Cement Review, 2004).

In Asia, Taiwan was the fifth ranked crude steel producer following China, Japan, the Republic of Korea, and India. Without any iron ore resources, Taiwan depended on imports to meet its demand. Iron ore imports were sourced mainly from Australia, Brazil, and Canada. In 2003, crude steel consumption on the island was about 25 Mt, about 18 Mt of which was supplied by domestic steel producers. The remainder was imported mainly from, in order of the amount of iron imported, Brazil, Japan, Russia, Ukraine, China, and South Africa. The island also imported 3.2 Mt of steel scrap from Japan, Russia, the Philippines, and the United States to meet domestic shortages for its electric arc furnaces (Steel Statistics Monthly, 2004).

To meet domestic steel demand, three companies expressed interest in building an integrated iron and steel plant in Taiwan. China Steel Corp. (CSC), which was the largest steel producer and only pig iron producer in Taiwan, planned to construct a blast furnace with an annual output capacity of 1.5 to 1.7 Mt/yr in Taichung. Yeih United Steel Corp. (Yusco), which was the island's leading stainless steel producer, planned to construct a 12-Mt/yr integrated steel plant either in China or Taiwan. Formosa Plastics Group, which was the island's leading manufacturing company, also considered constructing a 10-Mt/yr integrated steel plant in either Zhangzhou, Fujiang Province, China, or Dacheng, Taiwan. Hoping to take advantage of the huge market for steel in China, Taiwan's steel producers, including CSC and Yusco through their subsidiaries or alliances, planned to either expand their output capacities or construct new production facilities in China (Steel Statistics Monthly, 2003; Taiwan Headlines, 2003b§).

Owing to the increased demand for magnesium alloy chassis in electronic products, the consumption of magnesium in Taiwan increased sharply during the past couple of years. Magnesium consumption was 11,076 t in 2002 and was expected to increase to 15,000 t in 2003. The volume of magnesium ingot and chip imports increased by 70% in 2003 compared with that of 2002 and was expected to grow by 50% in 2004. In 2003, the Taiwan Magnesium Association was established to promote the magnesium industry and to conduct product development (Magnesium Monthly Review, 2003).

Taiwan had no domestic coal production and depended on imported coal to meet its demand for coal. Taiwan Power Co. (Taipower) was the largest coal consumer on the island and imported about 52% of Taiwan's coal imports. To reduce shipping costs, the Taiwan authorities approved Taipower's importation of as much as 30% of its total coal requirements from China. In 2002, Taipower imported a total of 22.6 Mt, of which 57% was from Indonesia and 11.4%, from China. The company planned to increase coal purchases from china and Indonesia and to reduce coal imports from Australia, South Africa, and the United States. The company also planned to increase the percentage of coal purchases made on the spot market to 60% in 2004 compared with 35% in 2002 and to consider investing in coal mines in China. Investment in China would have to be approved by the Taiwan authorities (Global Coal, 2003§).

Chinese Petroleum Corp.'s (CPC) overseas affiliate Overseas Petroleum and Investment Corp. (OPIC) and China National Offshore Oil Corp. formed a joint-venture company (Tainan-Chaoshan Petroleum Co.), which was registered in the Virgin Islands; it had initial capital of $50 million. The joint venture will explore for oil in a 15,400-square-kilometer area in the southern part of the Taiwan Strait. The partners will share the operating costs and exploration results equally. The initial study indicated that seven locations had potential oil resources. Drilling was scheduled to begin in 2003 but was postponed in May 2003 because of the outbreak of SARS in China and Taiwan. The Taiwan authorities approved CPC's request to establish representative offices in the cities of Beijing and Shanghai. In addition, CPC planned to set up offices in the cities of Chongqing, Guangzhou, Nanjing, and Shenyang under the auspices of OPIC to explore the petrochemical market in China. CPC planned to invest $450 million to explore oil resources in Australia, Peru, and Venezuela in 2004-08. CPC signed two separate contracts with China National Petroleum

Corp. and China Petrochemical Corp. to refine oil for these companies. CPC expected to refine 3 million barrels per year of oil for each company (Chinese Petroleum Corp., 2004§).

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15 Foochow Street
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TABLE 1
TAIWAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003
METALS						
Gold, primary	kilograms	13	9	2	--	--
Iron and steel, metal:						
Pig iron	thousand tons	9,020	9,971	10,316	10,524	10,779
Ferrosilicon		3,212	2,975	1,181	--	--
Steel, crude	thousand tons	16,027	17,302	17,336	18,255	18,563
Nickel, refined[e]		10,000	10,000	11,000	11,000	11,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	18,283	17,572	18,128	19,363	18,474
Feldspar		171	409	147	--	510
Fire clay		3,703	3,666	5,641	2,083	7,546
Gypsum, precipitated		1,747	1,884	1,006	--	--
Lime[e]		800,000	800,000	800,000	800,000	800,000
Mica		6,966	6,862	9,733	6,595	3,237
Nitrogen, N content of ammonia		146,228	11,004	11,870	11,050	11,200
Salt, marine		76,916	69,521	66,150	56,720	191
Sodium compounds, n.e.s.:						
Caustic soda		329,640	426,040	466,630	508,760	568,180
Soda ash[e]		140,000	140,000	140,000	140,000	140,000
Stone:						
Dolomite	thousand tons	201	119	71	55	54
Limestone	do.	2,819	3,505	4,901	3,677	1,434
Marble	do.	17,755	17,831	20,475	23,736	21,041
Serpentine	do.	358	395	276	268	194
Sulfur		194,812	205,588	223,659	212,343	225,006
Talc		201	--	130	27	466
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		100,000	100,000	100,000	100,000	100,000
Coal, bituminous		91,673	83,380	--	--	--
Gas, natural:						
Gross	million cubic meters	848	742	849	887	831
Marketed[e]	do.	780	670	780	785	760
Petroleum:						
Crude	thousand 42-gallon barrels	296	234	279	321	288
Refinery products[e]	do.	230,000	240,000	250,000	260,000	270,000

[e] Estimated; estimated data are rounded to no more than three significant digits. -- Zero.

[1] Includes data available through May 30, 2004.

TABLE 2
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilitites	Annual capacity[e]
Cement		Asia Cement Corp.	Hsinchu	1,800
Do.		do.	Hualien	4,020
Do.		Chia Hsin Cement Corp.	Kaohsiung	1,860
Do.		Chien Tai Cement Co. Ltd.	do.	1,720
Do.		Lucky Cement Corp.	Tungao	2,000
Do.		Southeast Cement Corp.	Kaohsiung	1,090
Do.		Taiwan Cement Corp.	Chutung	1,400
Do.		do.	Hualien	1,580
Do.		do.	Judung	1,220
Do.		do.	Suao	3,400
Do.		Universal Cement Corp.	Kaohsiung	1,550
Marble		Taiwan Marble Co., Ltd.	Panchiao	10
Nickel		Taiwan Nickel Refinery	Kaohsiung	14
Petroleum:				
Crude	thousand barrels per year	Chinese Petroleum Corp.	Chuhuangkeng and Tungtzuchiao	850
Refinery products	thousand barrels per day	do.	Kaohsiung	570
Do.	do.	do.	Taoyuan	200
Do.	do.	Formosa Plastics Group	Yunlin	450
Steel		China Steel Corp.	Kaohsiung	13,000
Do.		Feng Hsin Iron and Steel Co. Ltd.	Taichung Hsien	1,000
Do.		Yieh United Steel Co.	do.	1,000
Sulfur		China Petrochemical Development Corp.	Taipei	50
Titanium dioxide		DuPont Far East Co. Ltd.	Guanyin	100

[e] Estimated.

THE MINERAL INDUSTRY OF THAILAND

By John C. Wu

Thailand, which is located north of the Andaman Sea and the Gulf of Thailand, east of Burma, west of Cambodia and Laos, and north of Malaysia in Southeast Asia, was a middle-income developing country. Its land area is about 511,800 square kilometers (km^2). In 2003, Thailand's per capita gross domestic product (GDP) based on purchasing power parity was estimated to be $7,070 (International Monetary Fund, 2004§[1]). The country had a population of about 63.4 million.

In 2003, Thailand's identified mineral resources were antimony, ball clay, barite, bentonite, copper, diatomite, dolomite, feldspar, fluorite, gold, gypsum, iron ore, kaolin, lead, limestone, manganese, marl, phosphate, potash, quartz, rock salt, silica sand, tin, tungsten, and zinc (Department of Mineral Resources, 1998, p. 18). On the basis of quantity of reserves, diatomite, dolomite, gypsum, kaolin, limestone, marl, potash, and silica sand were more abundant than other identified minerals. The resources of barite, copper, fluorite, gold, gypsum, iron ore, lead, quartz, tin, tungsten, and zinc, however, were more important because of their higher economic value. Deposits of identified nonfuel minerals except copper and potash have been developed and produced for domestic consumption and export. Thailand also has small resources of coal, natural gas, and crude petroleum.

Recent exploration by the Government and private companies for nonfuel minerals in Thailand focused mainly on copper, gold, and potash. As a result of exploration during the past 10 years, the Chatree Mine in Pichit Province, which was the country's first medium-scale gold mine to use modern mining and mineral-processing technology, was completed and began operations in late 2001. In 2003, the Udon Thani Potash Project by Asia Pacific Resources Ltd. was waiting for Government approval of the mining leases; the development of the Puthep Copper Project by an Australian company in Loei Province was also waiting for Government approval for a feasibility study. Both projects were expecting Government approval in 2004.

In 2003, Thailand was one of the world's top producers of feldspar and gypsum (Olson, 2004; Potter, 2004). Thailand also was one of the world's leading exporters of cement, feldspar, and gypsum. The mineral production that was important to the Thai economy included barite, coal (lignite), dolomite, feldspar, natural gas, gemstones, gold, gypsum, kaolin, limestone, crude petroleum, rock salt, silica sand, tin, tungsten, and zinc. Some of these minerals were exported to earn foreign currency. The leading export minerals were feldspar, gold, gypsum, tin metal, tantalum powder, and zinc metal. Thailand continued to import such ferrous and nonferrous metals as primary aluminum, refined copper, iron and steel, refined lead, precious metals, and other minor metals to meet its domestic requirements.

According to the National Economic and Social Development Board, the output of the mining and quarrying sector grew by 6.8% in 2003 compared with 10.9% in 2002. The output value of the mining and quarrying sector, which was estimated to be $1.8 billion in 1988 constant dollars, contributed about 2.2% to the country's GDP in 2003. The continued growth in the mining and quarrying sector was the result of increased production of natural gas, crude petroleum, and such industrial minerals as clay, feldspar, fluorspar, gypsum, phosphate rock, silica sand, and quartz stone. The Thai economy, as measured by the GDP, increased by 6.7% in 2003 compared with 5.4% in 2002. The Thai GDP, in 1988 constant dollars, was estimated to be $83 billion in 2003. The growth in the country's economy was owing to increased output in every major economic sector, especially in the manufacturing sector, which grew by 10.3% in 2003 compared with 6.8% in 2002. The Thai total labor force increased to 34.9 million in 2003 from 34.3 million in 2002, and the rate of unemployment decreased to 2.0% in 2003 from 2.2% in 2002. The inflation rate, as measured by change in the Consumer Price Index, rose to 1.8% from 0.7% in 2002. The country's merchandise trade surplus rose to $4.2 billion in 2003 from $2.7 billion in 2002. The total external debt decreased to $51.8 billion in 2003 from $59.4 billion in 2002 (Bank of Thailand, 2004b§).

Government Policies and Programs

Thailand's mineral resources are owned by the state. Mineral exploration and development are governed by the Minerals Act of 1967, the Mineral Royalty Act No. 4 of 1966, and the Tin Control Act of 1977. The Minerals Act of 1967, which had been amended in 1973, 1979, and 1991, controls onshore and offshore exploration, mineral production, mineral trading, ore dressing, transport, and export of minerals except petroleum. The Minerals Act of 1967 was amended again in 2002 to bring the Act in line with modern international practices for underground mining that permit mining at depths of greater than 100 meters (m) below the surface without requiring the specific consent of the holder of the surface right.

The Mineral Royalty Act prescribes the rates of royalties to be assessed for different kinds of minerals. The Tin Control Act controls the mining, purchase, sale, and export of tin and contributions of tin to buffer stock. The Environmental Act and the Forestry Act govern environmental protection and management of the mining industry. The Enhancement and Conservation of National Environmental Quality Act controls the issues related to mining. The Forestry Act controls mining in general forest areas.

Under the Minerals Act of 1967, the Ministry of Industry was appointed the principal Government agency to regulate the mining sector, and the Department of Mineral Resources (DMR), which is under the Ministry, is responsible for the administration of exploration and production activities in accordance with geoscience and with the requirements of environmental protection. The DMR also is responsible for supervising the coastal zone management program, petroleum development, mineral exploration, environmental protection in offshore areas, and the formulation of a viable program for the inspection of all petroleum and mining operations to ensure enforcement of applicable regulations. It conducts research on such environmental issues as mined land rehabilitation and the effect of offshore mining on coral reefs, mangroves, recreation areas, and shorelines. It also provides consulting services to the mining companies concerning technologies and equipment to be used to prevent environmental pollution (Dheeradilok, 1998).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Environmental Issues

The adverse environmental impact of the proposed potash mining project in Udon Thani continued to be a major environmental issue in 2003. In March 2003, a six-member panel was named by the Ministry of Natural Resources and Environment (MNRE) to review the development plan for minimizing the adverse effects. According to one of the geologists who led an expert panel to review the project's environmental impact assessment (EIA) report, the EIA failed to establish levels of operation to minimize the negative effects on nearby villagers. It also failed to alleviate the negative impacts of potash tailings, which would be made up mainly of salt, on village households and equipment. The panel completed its review and reported its findings to the MNRE in June 2003. In 2003, Asia Pacific Resources Ltd. submitted a revised EIA to the Government that included additional information on ways in which the company would monitor environmental impacts and the technology it would use to cope with the potash tailings; the company also submitted a request for a mining concession to the Ministry of Industry (Ecology Asia, 2003a§, b§).

Production

Thailand's important minerals production in 2003 included barite, coal, dolomite, feldspar, natural gas, gemstones, gypsum, kaolin, limestone, crude petroleum, rock salt, silica, tin, tungsten, and zinc. The important processed mineral products were cement, fluorite (metallurgical grade), refined lead, refined petroleum products, steel, refined tin, and refined zinc. Thailand also produced tantalum metal powder and oxides, which were processed from such domestic and imported raw materials as tantalum-bearing scrap and tin slag.

In 2003, production of most industrial minerals except dolomite, marble, perlite, and pyrophyllite increased. Production of all metallic minerals except antimony and tungsten decreased considerably. In 2003, production of coal decreased; production of crude petroleum, natural gas condensate, and natural gas all increased considerably. Production of all processed minerals except refined tin increased because of the continued economic recovery (table 1).

Trade

In 2003, exports rose to $78.4 billion from $66.1 billion in 2002, and imports also rose to $74.2 billion from $63.4 billion in 2002. Thailand's merchandise trade surplus increased to $4.2 billion in 2003 from $2.7 billion in 2002. As a result, the Thai baht appreciated against the U.S. dollar by 3.6% to 41.5 baht against US$1.00 in 2003 compared with 43.0 baht in 2002. On the basis of two-way merchandise trade, Japan and the United States were the two major trade partners of Thailand in 2003 (Bank of Thailand, 2004a§, b§).

In the minerals trade, Thailand was a net importer of mineral commodities mainly because of its large import bills for coal, crude petroleum, iron and steel products, and nonferrous metals. According to Thailand's Custom Department, exports of major crude and intermediate mineral products totaled $919 million in 2003, of which gypsum was valued at $62 million; gold, $54 million; refined tin, $49 million; tantalum metal powder, $36 million; zinc and zinc alloys, $22 million; and all other mineral products, $696 million. Exports of major processed mineral commodities were base-metal products (which included iron and steel), $2.7 billion; precious stones and jewelry, $1.9 billion; and refined petroleum products, $1.5 billion (Bank of Thailand, 2004a§).

In 2003, imports of major mineral fuel commodities were as follows: coal, $214.4 million; crude petroleum, $7.1 billion; and refined petroleum products, $1.6 billion. Imports of major nonfuel mineral products were as follows: iron and steel products, $3.8 billion; other base metal products, $2.0 billion; jewelry and silver bar, $1.5 billion; and fertilizers, $849 million (Bank of Thailand, 2004a§).

Structure of the Mineral Industry

The structure of the mineral industry remained unchanged in 2003. Thailand's mineral industry consisted of a large mining and mineral-processing sector of industrial minerals and a small mining and mineral-processing sector of ferrous and nonferrous metals. The mining and quarrying industry employed about 47,000 workers in 2003. The energy sector, which included the production of coal, natural gas, and crude petroleum, was small but growing. Most nonfuel minerals mining and mineral-processing businesses were owned and operated by private companies incorporated in Thailand. Coal exploration and mining were operated principally by the state-owned Electricity Generating Authority of Thailand (EGAT) and several small local private coal mining companies. Oil and gas exploration and production were by the state-owned Petroleum Authority of Thailand (PTT) and several joint ventures of the PTT and foreign oil companies.

Commensurate with the Government's mineral policy to focus on the development of minerals for the domestic market, the production capacity of industrial minerals continued to increase in 2003. The cement industry, which had expanded by more than 40% of its capacity during the 1990s, had a production capacity of about 53.9 million metric tons per year (Mt/yr). The production capacity for exported minerals such as antimony, fluorite, and kaolin, however, had been shrinking during the past 5 years. Construction of Thailand's first copper smelter, which was halted in March 1998, resumed in 2003 and was scheduled to be completed by 2004. The country's production capacity of tantalum metal powder remained steady. This capacity, however, could be expanded if the worldwide demand for tantalum should rise again.

Commodity Review

Metals

Copper.—Progress of the Puthep copper development project was hampered by the Government watershed zoning over the PUT 1 deposit, which required the approval of the Thai Cabinet for land access and mining leases before the company could proceed with a feasibility study within the area. In 2003, Pan Australian Resources N.L. (PAR) of Australia and its joint-venture partner Padaeng Industry Public Co. Ltd. (PDI) reportedly submitted a watershed appraisal report and applied for mining leases and for Cabinet approval for land access to conduct a feasibility study. The company also had shifted its focus to the PUT 2 deposit where no watershed zoning issues were involved. The latest mineral resource estimates for the PUT 1 deposit were 84.5 million metric tons (Mt) at a grade of 0.44% copper, of which 22.1 Mt was indicated and 62.4 Mt, inferred; the mineral resource estimates for the PUT 2 deposit were 36.4 Mt at a grade of 0.42% copper, all of which were inferred (Pan Australian Resources N.L., 2003a§, b§).

Thai Copper Industries plc. (TCI), which suspended construction of its 165,000-metric-ton-per-year (t/yr) copper smelter and refinery in Rayong Province in March 1998, resumed construction of the smelter and refinery in 2003. In January 2003, the $115 construction contract was awarded to Aker Kvaerner ASA of Norway to complete the project in 15 months. The copper smelter and refinery were scheduled to be commissioned by mid-2004. Kvaerner E&C (Thailand) Ltd. and Kvaerner U.S. Inc. were responsible for the project. To resume construction, TCI reportedly raised a $174 million credit line from a consortium of local banks led by Krung Thai Bank and about $79 million in new equity capital from Thai Film Industry and Aker Kvaerner, which provided a loan and new capital in exchange for a 30% equity interest in TCI (Metal Bulletin, 2003a; Aker Kvaerner, 2003§).

Gold.—Kingsgate Consolidated N.L. of Australia, through its 90% owned subsidiary Akara Mining Ltd., operated the Chatree gold mine, which is located about 280 kilometers (km) north of Bangkok and 45 km southeast of the provincial capital of Pichit on the border of the Provinces of Petchabun and Pichit. To save mining and haulage costs in its open pit operations and to provide business for local enterprises, the Chatree Mine negotiated a new 4-year mining contract with a local contractor in July 2003 (Kingsgate Consolidated Ltd., 2003c§).

For the financial year that ended on June 30, 2003, ore production totaled 1.5 Mt, of which 1.3 Mt of ore at a grade of 3.9 grams per metric ton (g/t) gold was treated; the gold recovery rate was 90.2%; and production of gold and silver was 4,805 kilograms (kg) and 15,059 kg, respectively, at a total cash cost of $94 per ounce and a total production cost of $143 per ounce of gold. As a result, the Chatree Mine was rated as one of the world's lowest cost gold-mining operations. According to Thai DMR official statistics, the country's gold and silver production for calendar year 2003 was 4,269 kg and 12,496 kg, respectively (Kingsgate Consolidated Ltd., 2003a§).

In early 2003, the Kingsgate's board of directors approved an $8.1 million budget for an expansion project of the Chatree Mine and processing plant. Construction work started in April 2003. The expansion project, which added a new high-ratio semi-autogenous grinding (SAG) mill and two carbon-in-leach tanks, doubled the capacity of the cyanide deoxification circuit, and converted the existing low-ratio SAG mill to a ball mill, was completed in December 2003. The expansion, which was completed under budget, raised the throughput of the mine by 50% to 1.8 Mt/yr (Kingsgate Consolidated Ltd., 2003a§, b§).

During 2003, Kingsgate continued its exploration at Prospect A, which is located about 1 km north of the Chatree Mine. The drilling program at Prospect A, which was extended by 3,000 m to 14,000 m owing to continuing positive results, was completed in April 2003. The company released its revised mineral resources estimate at Prospect A in May 2003. The first ore reserves (proved and probable) estimate, which was based on an infill drilling of about 12,000 m, was 7.4 Mt at grades of 1.7 g/t gold and 18 g/t silver, which contained 402,400 ounces (12,520 kg) of gold and 4,320,000 ounces (134,400 kg) of silver. The reported ore reserves estimate was based on cutoff grades of 0.7 g/t gold for oxide ore and 0.8 g/t gold for primary ore using a gold price of $330 per ounce (Society of Economic Geologists, 2003; Kingsgate Consolidated Ltd., 2003a§; MBendi Information Services (Pty.) Ltd., 2003§).

In 2003, Thong Kam Co. reportedly was granted a gold mining license in the area of Loei Province. The gold project, however, had not been started by the end of 2003 (Department of Mineral Resources, 2003b§).

Iron and Steel.—Iron ore production dropped to 9,675 t from 570,110 t in 2002. Thailand continued to rely on imports of ferroalloys, pig iron, steel scrap, and crude steel (billet, slab and ingots) to meet the requirements for its rolling steel mill sector in 2003.

In 2003, Thailand's crude steel production increased by 41% to 3.6 Mt. According to the Southeast Asia Iron and Steel Institute (SEAISI), Thailand's production of hot-rolled (carbon) steel increased by 11% to 7.5 Mt, imports of iron and steel products decreased by 1.8% to 9.9 Mt, and exports of iron and steel products increased by 15.7% to 1.9 Mt. Apparent consumption of total steel products increased by 10.2% to a record-high level of 11 Mt in 2003 (Southeast Asia Iron and Steel Institute, 2004a§).

Thai steel consumption was projected to grow by 6% to 7% in 2004 and 2005. The Iron and Steel Institute of Thailand expected that the rising costs of raw materials would pose major problems for the domestic steelmakers in terms of their competitiveness against imports, even though the domestic demand for their product from the automobile, construction, and household goods sectors would remain strong (Metal Bulletin Monthly, 2003).

In May 2003, the Thai Government, through the Ministry of Commerce, decided to impose antidumping duties that ranged from 5.98% to 136.5% on hot-rolled steel imported from Japan and 13 other countries, which included Algeria, Argentina, India, Indonesia, Kazakhstan, the Republic of Korea, Romania, Russia, Slovakia, South Africa, Taiwan, Ukraine, and Venezuela. A 36.25% tariff was imposed on imports from Japan. The Government would consider exempting antidumping duties on hot-rolled steel imports from Japan, however, if the local steel industry could not produce Japan's high-standard hot-rolled steel (Southeast Asia Iron and Steel Institute, 2003b§).

In December 2003, the Thai Government announced that import taxes would be gradually reduced to 5% on certain items. The previous 10% import tax imposed on various hot-rolled steel products would be reduced to 7.5% for the period between December 16, 2003, and December 31, 2004, then reduced to 5% beginning on January 1, 2005. The previous 12% import tax imposed on cold-rolled steel sheet in coils and cold drawn bar would be reduced to 9.5% for the period between December 16, 2003, and December 31, 2004; to 7% for calendar year 2005; to 6% for calendar year 2006; and to 5% beginning in January 2007. The previous 15% import taxes imposed on coated steel products would be reduced to 12% for the period between December 16, 2003, and December 31, 2004; to 9% for calendar year 2005; to 7% for calendar year 2006; and to 5% beginning in January 2007 (Southeast Asia Iron and Steel Institute, 2004b§).

In June 2003, Nakornthai Strip Mill Plc (NSM) announced that it would merge with Siam Integrated Cold Steel (SICOS). NSM planned to raise $85 million through a public share offering; $65 million would be used to fund the facilities for the production of hot-rolled steel, and $20 million would be used as working capital. After the merger, NSM would have a production capacity of 1.5 Mt/yr of hot-rolled steel and 500,000 t/yr of cold-rolled steel (Southeast Asia Iron and Steel Institute, 2003a§).

Lead.—Lead mining from the Song Toh area in Kanchanaburi Province had stopped since 2000 because of lead contamination in Klity Creek in the Thung Yai Naresuan Wildlife Sanctuary. According to the Thai DMR, only small amounts of lead had been produced from Tak Province between 2001 and 2002 and there was no lead mine production in 2003. To resume lead mining, the Ministry of Industry reportedly was planning to ask the Thai Cabinet to set aside a 77-km^2 area of prime forest land from a proposed 600-km^2 area of the Lam Klong Ngu National Park, which is adjacent to a World Heritage site of the Thung Yai Naresuan Wildlife Sanctuary in Kanchanaburi Province. According to the Department of Basic (Primary) Industries and Mines, the area was estimated to contain about 7.73 Mt of lead reserves. The Forestry Department had previously delayed or rejected requests for mining permits in that area. The Bo Ngam Group that had operated a lead mine in the area for more than two decades stopped mining after 1995 and lead mining operations by Kanchanaburi Exploration and Mining Co. Ltd. in the area had also been idled since December 2002 (Ecology Asia, 2003c§).

Tungsten.—Mine production of tungsten increased sharply in 2003 owing to the opening of a new mine, which is located near the small town of Ban Pin, which is about a 2-hour drive southwest of Chiang Mai in northern Thailand. In 2001, the Government awarded mining and export licenses to SC Mining Co. Ltd. for the production of high-grade ferberite (an iron tungsten mineral) concentrate for export. SC Mining, which used modern mining equipment and mineral-processing technology, was fully funded and 100% owned by the Som Chai family (Black, 2003).

Zinc.—Mine production of zinc ore was solely by PDI at the Padaeng Mine, which is located 12 km southeast of Mae Sot in Tak Province. Zinc silicate ore production from the mine increased by 32.6% to 249,539 t in 2003. The average metal content of zinc silicate ore produced in 2003 was about 25% zinc. All zinc ore and concentrates, which included imports, were delivered to the zinc smelting and refining facilities in Tak Province for the production of zinc metal. As of December 31, 2003, total mineral resources of the Padaeng Mine were estimated to be about 4.6 Mt, of which about 4.1 Mt was exploitable resources at a grade of 12.3% zinc (Padaeng Industry Public Co. Ltd., 2004§).

PDI's zinc smelter in Tak, which is located 96 km from the Padaeng Mine, consumed 306,549 t of ore and concentrate in 2003, of which 149,539 t was domestic ore and 157,010 t was imported ore mainly from Australia, Peru, and neighboring countries in Southeast Asia. In 2003, overall zinc production increased by 8.1% to 113,686 t, of which 69,600 t was zinc slab (ingot) and 44,086 t was zinc alloy (Padaeng Industry Public Co. Ltd., 2004§).

In 2003, imports of zinc ore totaled 151,623 t and were valued at $39.44 million. Exports of zinc ingot and alloy increased by 17.8% to 24,119 t compared with 20,467 t in 2002, and were valued at $21.75 million (Department of Mineral Resources, 2003a§).

Industrial Minerals

Barite.—Production of barite decreased by 16% to 115,600 t compared with 137,469 t in 2002 owing mainly to a halt in production of drilling mud-grade barite powder in 2003. Asian Mineral Resources and Pands Group Mining & Milling Co., through its subsidiary P & S Barite Mining Co. Ltd., operated mines and beneficiation plants in the Provinces of Loei and Mae Hong Son in northern Thailand and in the Provinces of Nakhon Si Thammarat and Satun in southern Thailand. Additionally, 5 to 6 other small-scale barite mining companies operated in the Provinces of Loei, Mae Hong Son, Nakhon Si Thammarat, and Udon Thani.

Of the barite produced in 2003, 4.6% was chemical grade and 95.4% was not ground. In 2003, Thailand exported 28,289 t of barite, of which 9% was chemical grade; 29%, drilling mud-grade; and 62%, not ground. Imports of barite increased by 50.9% to 28,379 t in 2003 compared with 18,808 t in 2002 (Department of Mineral Resources, 2003a§).

Cement.—Thailand's clinker output decreased by 11.4% to 33.6 Mt in 2003 following a 13% increase in 2002 and a 14.2% increase in 2001. Cement production, however, increased by 2.7% to 32.5 Mt in 2003 following a 13.5% increase in 2002 because of the continued growth in domestic demand for cement for residential housing construction in 2003. This growth resulted largely from Government policies to stimulate housing demand, which included lower interest rates, tax reductions on house purchases, and the development of housing projects for low-income families. The overall growth in the construction sector, however, was much slower in 2003 than in 2002 because of a slowdown in construction activities in the commercial sector and infrastructure projects in 2003.

According to the Thailand Fellowship of Cement Manufacturers, the cement industry's production capacity was

54 Mt/yr in 2003. Domestic demand increased by 4% to 23 Mt in 2003. Thai demand for cement was expected to grow at a rate of 7% in 2004, with private consumption as the main driver, and the cement price was expected to increase in 2004. Exports of cement totaled 13.8 Mt in 2003 (Bangkok Post, 2004§).

In 2003, Siam Cement Industry Co. Ltd., which was the country's leading cement producer, operated at 67% of its capacity of 23.2 Mt/yr and had 38% of the market share. Siam City Cement Public Co. Ltd., which was the country's second ranked cement producer, operated at 68% of its capacity of 14.5 Mt/yr and had 27% of the market share. TPI Polene Co. Ltd. (TPIPL), which was the third lranked cement producer, operated at 62% of its capacity of 9 Mt/yr and had 18% of market share. Asia Cement Public Co. Ltd. signed a service agreement with Jalaprathan Cement Public Co. Ltd.; both companies, which were controlled by Italcementi Group of Italy, operated at 73% of their combined capacity of 7.1 Mt/yr and had a combined market share of 13% (Thailand Fellowship of Cement Manufacturers, 2003).

Potash.—Asia Pacific Resources Ltd. (APR) announced in May 2003 that it had submitted an application for four mining leases for the mining area that covers the potash deposits in Udon Thani South in northeastern Thailand, in compliance with the terms of the concession agreement between the company and the Government. The Udon Thani South deposit's potash resources were estimated to be 302 Mt at a grade of 23.5% K_2O, of which 30 Mt at 26.8% K_2O was within a high-value core area that averaged 7.2 m in thickness (Asia Pacific Resources Ltd., 2003c§).

In November 2003, APR announced that its subsidiary Asia Pacific Potash Corp. (APPC) had signed a memorandum of understanding (MOU) with Beijing-based China State-Owned Enterprise Investment Company (CSEIC). According to the MOU, the two companies would work together to develop APPC's Udon Thani potash deposit in northeastern Thailand; combine their efforts in particular to secure long-term offtake commitments for the supply of potash to the agricultural markets in China, Thailand, and other Asian countries; and arrange financing of about $300 million, which was the estimated capital cost for the first stage of the proposed 2 Mt/yr Udon South Mine. APR reportedly was still in discussions with other potential investors and strategic partners who could bring value to the project (Asia Pacific Resources Ltd., 2003b§).

In November 2003, APPC filed the application for the extended special prospecting licenses to facilitate the extension of the expiring special prospecting licenses held by the company over the Udon North potash deposits where the potash resources were estimated to be 665 Mt at a grade of 16% to 17% K_2O (Fertilizer Week, 2003; Asia Pacific Resources Ltd., 2003a§).

Mineral Fuels

Coal.—Coal (lignite) production decreased by 3.8% to 18.8 Mt in 2003. EGAT, which operated the Mae Moh, Sop Prap, and Muang mines in the Provinces of Lampang and Krabi, produced about 16 Mt; the remaining 2.8 Mt was produced by Banpu Public Co. Ltd. and Lana Lignite Public Co. Ltd., which operated mines in the Province of Lampang, and several other coal mining companies that operated in the Provinces of Lampang, Lamphum, Phayao, and Phetchaburi. To meet the overall coal demand, Thailand imported 7.1 Mt of coal, which was valued at $255.8 million in 2003. Of that total, 6.51 Mt was bituminous, which was an increase of 32% compared with the 4.94 Mt imported in 2002; 532,860 t was anthracite; and 64,750 t was coking coal, which was a decrease of 8.3% compared with the 70,650 t imported in 2002 (Energy Policy and Planning Office, 2004a§).

In 2003, EGAT conducted additional coal surveys and exploration in Wiang Haeng District, Chiang Mai Province and in Saba Toi District, Songkhla Province. For the northern Wiang Haeng basin in Chiang Mai, EGAT was permitted to develop the coal basin without a bidding process, provided that the project's EIA was approved by the Government. Chiang Mai University was appointed to conduct the EIA for the project, which was scheduled to start in 2004; the EIA would include a public participation component to allow the local community to participate in the environmental impact study. Additionally, EGAT also was granted a permit to develop the Saba Yoi coal basin in Songkhla Province. Community development and public communication programs had been carried out continuously in 2003 (Electricity Generation Authority of Thailand, 2003).

In May 2003, more than 1,000 villagers from Wiang Haeng District, Chiang Mai Province, reportedly submitted a petition to the Ministry of Natural Resources and Environment to protest plans to build a coal (lignite) mine in the area. The project site was a watershed area of the Mae Taeng River that provided tap water to the Chiang Mai provincial capital about 70 km away; in addition, some farmers relied on the Mae Taeng River to grow garlic, which was the main crop in the area (Ecology Asia, 2003d§).

Demand for domestically produced lignite totaled 17.9 Mt in 2003, of which 15.4 Mt was consumed by EGAT in power generation at the 2,625-megawatt Mae Moh lignite-fired powerplant and 2.5 Mt was consumed as energy by the manufacturers of cement, paper, fiber, and lime; tobacco curers; and other users. Demand for imported coal (mostly anthracite, bituminous, and coking coal), which totaled 7.1 Mt, was consumed mainly by the manufacturers of cement and ferrous and nonferrous metals and by other end users (Energy Policy and Planning Office, 2004a§).

Natural Gas and Petroleum.—Thailand's natural gas production increased by 6% to an average of 59.6 million cubic meters per day in 2003 from an average of 56.2 million cubic meters per day in 2002 owing mainly to a 36% increase in output from the Pailin Gasfield. In 2003, natural gas was produced from 19 gasfields, most of which were located offshore. About 54% of Thailand's natural gas was produced by Unocal Thailand Ltd. (UT) from 10 offshore gasfields and condensate fields (Baanpot, Erawan, Funan, Gomin, Jakarawan, Pailin, Platong, Satun, South Satun, and Trat); the remaining 46% was produced by PTT Exploration and Production (PTTEP) (the upstream subsidiary of PTT), ChevronTexaco Corporation, and other companies, from seven offshore gasfields (Benjamas, Bong Kot, Plamuk, Plandaeng, Surat Thani, Tantawan, and Yala) and two onshore gasfields (Nam Phong and Sirikit) (Energy Policy and Planning Office, 2004c§).

UT, which was Thailand's leading gas producer, operated 100 platforms in the central Gulf of Thailand. It supplied 75% of its natural gas output to meet 33% of Thailand's power-generation requirements and 25% to meet fuel requirements for the manufacturing and transportation industries, for household cooking, and as feedstock for petrochemicals. In 2003, UT signed an agreement with PTT to amend and extend two of UT's gas sales contracts; the company would increase sales volume from 20.95 million cubic meters per day in 2003 to 24.07 million cubic meters per day in 2006 and to 35.11 million cubic meters per day in subsequent years. To supply the increased gas sales to PTT, UT and its partners planned to spend about $4 billion on exploration and production at three gasfields in the Gulf of Thailand during the next 10 years. UT and its partners reportedly were to spend $300 million on natural gas development in the Gulf of Thailand in 2003 (Petroleum Economist, 2003b, c; ASEAN Center for Energy, 2003c§, d§).

The state-owned PTTEP announced that it would spend $2.14 billion for its capital and operation expenditures during the next 5 years. About 38% of the total would be for developments in its existing Bongkot and Pailin Gasfields in the Gulf of Thailand and the Yadana and the Yeagun Gasfields offshore Burma; about 40% of the total would be for future development of the Arthit Gasfield and B17 in the Thailand-Malaysia joint development area. In 2003, PTTEP and its partners also signed an amendment to the Pailin gas sales agreement with PTT to reduce the Pailin gas price by 3% and to increase the daily contractual quantity by 7% to about 10 million cubic meters per day effective October 1, 2003 (Petroleum Economist, 2003a; ASEAN Center for Energy, 2003b§).

Production of crude petroleum increased by 27.5% to an average of 96,322 barrels per day (bbl/d), and that of condensate, by 16.6% to an average of 62,663 bbl/d in 2003. The 2003 increase in crude petroleum output was the result of increased production from the Benjamas and the Plamuk Oilfields. In 2003, crude petroleum was produced from 10 oilfields. The Benjamas, which was the largest offshore oilfield, was operated by Chevron Offshore (Thailand) Ltd. and produced 51.2% of the country's total; the Sirikit, which was Thailand's largest onshore oilfield, was operated by Thai Shell Exploration and Production Co. Ltd. and produced 19.9%; the Plamuk, which was Thailand's second largest offshore oilfield, was operated by UT and produced 21.0%; and the Tantawan, which was Thailand's third largest offshore oilfield, was operated by Chevron Offshore (Thailand) and produced 5.4% in 2003. In November 2003, Chevron Offshore (Thailand) Ltd. reportedly discovered oil and gas in two exploration wells in block 9A in the Gulf of Thailand. The company applied for a production area license for the two wells—Tantawan 23 and Tantawan 24. The remaining 2.5% was produced from six smaller oilfields. In 2003, about 27.1% of condensate was produced from the Pailin Gasfield; 25.1%, the Bongkot Gasfield; and 19.3%, the Erawan Gasfield (ASEAN Center for Energy, 2003a§; Energy Policy and Planning Office, 2004b§, c§).

To meet its overall demand for crude petroleum, Thailand imported 775,870 bbl/d of crude petroleum, which accounted for about 89% of the total crude petroleum supply of 872,192 bbl/d in 2003. Thailand's refinery intake totaled 846,091 bbl/d in 2003 compared with 827,688 bbl/d in 2002. Thailand's total refining capacity was 703,100 bbl/d of crude petroleum. Shell Co. of Thailand Ltd. had a 275,000-bbl/d-crude-capacity refinery in Map Ta Phut, Rayong Province; Thai Oil Co. Ltd. had a 192,850-bbl/d-crude-capacity refinery in Sriracha, Chonburi Province; Esso Standard Thailand Ltd. had a 173,500-bbl/d-crude-capacity refinery in Sriracha, Chonburi Province; and PTT Plc had a 61,750-bbl/d-crude-capacity refinery in Bang Chak, Bangkok (Oil & Gas Journal, 2002).

Outlook

During the next 4 to 5 years, the Thai mining sector is expected to expand and contribute more to the country's GDP because of the likely development of the Puthep copper mine in Loei Province, the Somboon potash mine in Udon Thani Province, the Wiang Haeng coal (lignite) mine in Chiang Mai Province, and the development and expansion of new and existing offshore gasfields in the Gulf of Thailand. During the next 2 years, the mineral industry of Thailand is expected to continue to be dominated by the production of coal, gold, gypsum, and limestone. Thailand is expected to become one of the refined copper producers in Asia and the Pacific by the end of 2004.

Thailand's economy is forecasted to grow at a faster pace in the next 2 years than it did in 2002 and 2003. The International Monetary Fund projects that the Thailand's GDP will grow at a rate of 7.0% in 2004 and 6.7% in 2005 (International Monetary Fund, 2004§).

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- Mineral Statistics of Thailand, annual.
- Metal Statistics of Thailand, annual.

TABLE 1
THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003
METALS						
Antimony:						
Ore:						
Gross weight		130	178	40	3	83
Sb content		59	84	18	1	38
Metal, smelter		40	16	12	--	--
Gold	kilograms	--	--	320	4,950	4,269
Iron and steel:						
Iron ore:						
Gross weight		122,633	100	50	570,110	9,675
Fe content[e]		61,000	50	25	285,000	4,800
Crude steel	thousand tons	1,532	2,100	2,127	2,538 [r]	3,572
Lead:						
Ore:						
Gross weight		23,783	24,760	800	6,500	--
Pb content		11,900	15,600	500	3,200	--
Metal, refined:						
Primary		3,025	3,390	3,500	2,000 [r]	2,000
Secondary		23,741	23,803	23,000 [r]	28,000 [r]	28,000
Total		26,766	27,193	26,500 [r]	30,000 [r]	30,000
Manganese ore:						
Battery- and chemical-grade, 75% MnO_2		46	225	45	--	--
Metallurgical-grade, 46% to 50% MnO_2		675	--	--	--	--
Total, gross weight		721	225	45	--	--
Total Mn content[e]		360	110	23	--	--
Silver	kilograms	--	--	1,159	18,018	12,496
Tantalum, metal and oxide powder		98	210	150	200	150
Tin:						
Concentrate:						
Gross weight		3,400	2,363	2,383	1,384	980
Sn content		2,712	1,930	1,950	1,130	793
Metal, smelter, primary		17,306	17,076	22,387	17,548	15,763
Tungsten concentrate:						
Gross weight		54	54	92	53	390
W content[e]		30	30	50 [r]	31 [r]	208
Zinc:						
Ore:						
Gross weight		185,752	159,093	88,664	151,876 [r]	148,297
Zn content[e]		24,000	27,000	15,300	33,600	37,100
Metal, primary		75,639	77,525	74,129	72,502	69,600
Alloy, Zn content		21,653	23,617	30,668	32,646	44,086
Zirconium concentrate, gross weight		--	100	--	--	--

See footnotes at end of table.

TABLE 1--Continued
THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003
INDUSTRIAL MINERALS						
Barite		76,092	56,180	23,559	137,469	115,600
Cement, hydraulic	thousand tons	25,354	25,499	27,913	31,679	32,530
Clays:						
Ball clay		317,877	394,154	341,272	450,818	579,404
Kaolin, marketable:						
Beneficiated, washed		113,005	201,226	168,063	127,132	184,562
Nonbeneficiated, unwashed		243,213	286,912	125,133	168,883	373,811
Filler		14,765	19,836	13,520	3,150	950
Diatomite		2,332	390	720	780	1,288
Feldspar		626,415	542,991	710,543	783,733	824,990
Fluorspar, crude, metallurgical-grade		13,005	4,745	3,020	2,270	2,368
Gemstones	thousand carats	1,267	928	1,071	1,597	716
Gypsum	thousand tons	5,005	5,830	6,191	6,326	7,291
Mica		78	107	72	--	--
Perlite		5,800	6,000	9,915	7,600	5,700
Phosphate rock, crude		3,880	3,260	2,359	3,680	13,870
Salt:						
Rock		739,502	792,250	852,565	908,968	892,243
Other[e]		100,000	100,000	100,000	100,000	100,000
Sand, silica, glass		531,588	471,547	513,880	781,014	1,293,929
Stone:						
Calcite		72,130	87,100	159,050	172,760	232,025
Dolomite		485,393	625,127	871,308	933,209	865,708
Granite:						
Dimension stone	cubic meters	6,190	7,595	6,659	7,597	9,866
Industrial rock	thousand tons	2,139	2,154	2,546	3,370	3,107
Limestone:						
For cement manufacture only	do.	48,306	43,492	46,984	54,214 [r]	46,362
Construction and other uses	do.	35,853	37,017	40,100 [r]	56,226 [r]	66,073
Marble, dimension stone and fragment	cubic meters	294,337	270,036	314,445	461,272	339,166
Marl for cement manufacture only		32,044	7,290	7,755	83,135	80,405
Quartz		3,760	5,177	48,908	32,954	65,559
Shale for cement manufacture only	thousand tons	3,223	3,110	3,364	5,017	3,488
Talc and related materials:						
Pyrophyllite		38,053	46,011	59,602	103,496	73,556
Talc		4,960	7,390	6,838	1,702	8,501
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite	thousand tons	18,261 [r]	17,786 [r]	19,607 [r]	19,572 [r]	18,830
Natural gas, gross production	million cubic meters	19,307	20,190	19,637	20,527 [r]	21,767
Petroleum:						
Crude	thousand 42-gallon barrels	12,412	21,147 [r]	22,599 [r]	27,582 [r]	35,158
Natural gas condensate	do.	18,115	19,060 [r]	18,924 [r]	19,609	22,872
Refinery products:						
Liquefied petroleum gas	do.	28,853	32,511	37,067	37,069	38,872
Gasoline	do.	54,290	50,862	52,376	51,896	54,342
Jet fuel	do.	25,908	27,347	26,651	29,373	26,778
Kerosene	do.	2,181	3,090	3,693	3,457	4,386
Distillate fuel oil	do.	49,242	43,970	40,669	37,610	38,248
Residual fuel oil[e]	do.	22,000	22,000	22,000	22,000	23,000
Unspecified[e, 2]	do.	3,500	3,500	3,500	3,500	3,500
Total[3]	do.	186,000	183,000	186,000	185,000	189,000

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[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Includes data available through September 3, 2004.

[2] Includes refinery fuel and refinery gains or losses.

[3] Data are rounded to three significant digits; may not add to total shown.

Sources: Department of Mineral Resources, Mineral Statistics of Thailand, 1998-2003 and Metal Statistical Yearbook, 2003; Ministry of Commerce, Energy Policy and Planning Office, Energy Data Notebook, 1989-2003, 15-year Series Report.

TABLE 2
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Barite	Asian Mineral Resources Co. Ltd.	Loei, Mae Hong Son, Nakhon Si Thammarat, and Satun Provinces	60
	P & S Barite Mining Co. Ltd.	Loei and Nakhon Si Thammarat Province	60
Cement	Asia Cement Co. Ltd.	Pra Phutthabath, Saraburi Province	4,800
Do.	Jalaprathan Cement Co. Ltd. (Cement Franciais S.A., 37%; Veatprapat Holding Co. Ltd., 19%; others, 44%)	Takli, Nakhorn, Sawarn Province; and Cha-Am, Petchburi Province	2,350
Do.	Samukee Cement Ltd.	Pakchong, Nakhon Ratchasima Province	125
Do.	Saraburi Cement Co. Ltd. (CEMEX Asia Holdings Ltd. of Mexico, 99%)	Chalerm Phrakiat, Saraburi Province	700
Do.	Siam Cement Industry Co. Ltd. (Bureau of the Crown Property, 30%; Thai Security Depository Co. Ltd., 6.94%; CPB Equity Co. Ltd., 5.6%; other financial Institutions and general public, 57.46%)	Kaeng Khoi, Phabhudhabat, and Khao Wong, Saraburi Province; Chae hom, Lampang Province; Thung Song, Thammarat Province; and Ta Luang, Ayutthaya Province	23,200
Do.	Siam City Cement Co. Ltd. (Holcim Ltd. of of Switzerland, 33.7%; Rattanarak family, 27%; other investors, 39.3%)	Kaeng Khoi, Saraburi Province	14,500
Do.	TPI Polene Co. Ltd.	Kaeng Khoi, Saraburi Province	9,000
Coal, lignite	Electricity Generating Authority of Thailand	Mae Moh, Lampang Province; Li, and Lamphun Province	20,000
Do.	Lanna Resources Public Co. Ltd.	Baan Pa Kha, Lampang Province; and Nong Ya Plong, Petchburi Province	1,800
Fluorspar, concentrate	Asian Mineral Resources Co. Ltd.	Mae Hong Son Province	14
Gas, natural million cubic meters per day	Esso Exploration and Production Khorat Inc.	Namphong, Khon Kaen Province	4
Do. do.	TOTAL Exploration and Production (Thailand)	Bongkot in the Gulf of Thailand	15
Do. do.	Unocal Thailand Ltd.	Baanpot, Erawan, Funan, Kaphong, Pladang, Satun, Paili, Trat, all in the Gulf of Thailand	33
Gold kilograms	Akara Mining Ltd. (Kingsgate Consolidated N.L. of Australia, 100%)	Chatree, Pichit Province	5,000
Gypsum	Thai Gysum Products Pcl. (Thaigips Holdings Ltd., 40.75%; BPB Gypsum B.V., 30%; others, 29.25%)	Nong Bau, Nakhon Sawan Province and Ban Munnak, Phichit Province	2,000
Do.	Vanich Gypsum Co. Ltd.	Khlong Prab, Mai Riang, Thoong Yai Mai in Provinces of Nakhon Si Thammarat and Surat Thani	2,000
Lead, in concentrate	Kanchanaburi Exploration and Mining Co. Ltd.	Song Toh, Nong Phai, and Bo Ngam in Kanchanaburi Province	30
Petroleum, crude included condensate thousand 42-gallon barrels per day	Chevron Offshore (Thailand) Ltd.	Benjamas, Tantawan, offshore in the Gulf of Thailand	35
Do. do.	Tahi Shell Exploration and Production Co. Ltd.	Sirikit in Kamphaenghet Province	24
Do. do.	TOTAL Exploration and Production (Thailand)	Bongkot, offshore in the Gulf of Thailand	12
Do. do.	Unocal Thailand Ltd.	Baanpot, Erawan, Funan, Gomin, Jakrawan, Kaphong, Pailin, Platon, Satun, Surat, Trat Plamuk, offshore in the Gulf of Thailand	38
Steel, rolled	The Bangkok Iron and Steel Works Co. Ltd.	Phrapradaeng, Samutprakarn Province	120
Do.	Bangkok Steel Industry Public Co. Ltd.	do.	300
Do.	Millenium Steel Co. Lt. (Siam Cement Public Co. Ltd., 45%; NTS creditors, 44.65%; McDonald Investment, 6.58%; NTS shareholders, 3.77%)	Provinces of Chon Buri, Muang Rayong, and Saraburi	1,700
Do.	Namheng Steel Co. Ltd.	Lopburi Province	350
Do.	Sahaviriya Group Corp. Ltd.	Bang Saphan, Prachuap Khiri Khan Province	2,400
Do.	Siam United Steel Co. Ltd.	Rayong Province	1,000
Do.	Siam Yamato Steel Co. Ltd.	Muang, Rayong Province	600
Tantalum, metal powder and oxides metric tons	H.C. Starck (Thailand) Co. Ltd. (H.C. Starck GmbH, 94.98%; others, 5.02%)	Map Ta Phut, Rayong Province	250

TABLE 2--Continued
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equirty owners	Location of main facilities	Annual capacity
Tin:			
Concentrate	Numerous small companies	Nakhon Si Thammarat, Phangnga, Phuket, and Ranong Provinces	3
Refined	Thailand Smelting and Refining Co. Ltd. (Amalgamated Metal Corp., 75.25%; other, 24.75%)	Phuket, Phuket Province	30
Zinc:			
In concentrate	Padaeng Industry Public Co. Ltd. (Umicore SA of Belgium, 44.77%; Ministry of Finance, 13.81%; others, 41.42%)	Mae Sot, Tak Province	30
Refined	do.	Tak, Tak Province	105

THE MINERAL INDUSTRY OF VIETNAM

By John C. Wu

Vietnam, which is located north of the Gulf of Thailand, west of the Gulf of Tonkin and the South China Sea, east of Cambodia and Laos, and south of China in Southeast Asia, was a low-income developing country. Its per capita gross domestic product (GDP) based on purchasing power parity was estimated to be $2,337 (International Monetary Fund, 2004§[1]). Vietnam's land area is about 325,400 square kilometers (km^2). It had a population of about 80.7 million in 2003.

The country has a wide variety of mineral resources. According to the Department of Geology and Minerals of Vietnam, the identified important mineral resources were bauxite, chromite, coal, copper, natural gas, gold, iron ore, nickel, crude petroleum, phosphate rock (apatite), rare earths, tin, titanium, and tungsten. Other identified but less important mineral resources were barite, carbonate rocks (limestone, and marble), gemstones (ruby and sapphire), graphite, lead, manganese, silica sand, zinc, and zirconium (Le Van De, 1996; Lai Hong Thanh, 2002§; Truong Duc Chinh, 2002§). In 2003, Vietnam was the third ranked producer of anthracite coal in the world, the sixth ranked producer of crude petroleum in the Asia and the Pacific region, and one of the major producers of ilmenite and phosphate rock in Asia (Oil & Gas Journal, 2003b; U.S. Energy Information Administration, 2004§).

The exploration conducted by the state-owned mining companies and foreign companies during the past 5 years had identified substantial bauxite reserves in the Central Highlands. A significant polymetallic deposit that contains substantial reserves of tungsten and associated minerals, such as bismuth, copper, fluorite, and gold, was also discovered at Nui Phao, which is located about 80 kilometers (km) north of Hanoi in the Province of Thai Nguyen.

With the exception of carbonate rocks, coal, and hydrocarbons, most mineral resources remained largely unexploited owing to Vietnam's outdated mining equipment and technology, poor infrastructure, and uncompetitive Government policy to attract foreign investors in mining.

Exploitation of the country's ferrous and nonferrous metals resources was still in the early stage of development. Mining and processing were by the state-owned and non-state-owned joint-stock, limited liability, and private companies, combines, cooperatives, and individuals, mostly through small- and medium-scale operations.

The mining and quarrying sector, which was dominated by the coal, construction materials, and oil and gas industries, comprised 456 state-owned companies and the following non-state-owned entities: 120 joint-stock, limited liability, and private companies; 114 combines and cooperatives; 118 individuals; and 18 foreign-owned companies (Lai Hong Thanh, 2002§). The total number of employees in the mining and quarrying sector was about 227,500 (General Statistics Office, 2003, p. 41).

In 2002 (the last year for which data were available), the output of the mining and quarrying sector contributed 6.2% to Vietnam's GDP. The output value of the mining and quarrying sector at 1994 constant prices was estimated to be $1.27 billion in 2002. Vietnam's GDP at 1994 constant prices was estimated to be $20.54 billion in 2002 (General Statistics Office, 2003, p. 57-58).

In 2003, Vietnam's real GDP grew by 7.1% compared with 6.4% in 2002. The higher economic growth in 2003 was the result of a 9.4% increase in domestic demand and a 15.8% increase in investment. On the supply side, the industry sector, which contributed 38.7% to Vietnam's GDP in 2003, grew by 9.6%. The country's inflation rate was 4.5% compared with 4.0% in 2002 (Asian Development Bank, 2004§; Vietnam Panorama, 2004a§).

In 2003, the country had a merchandise trade deficit of about $5 billion, with imports and exports estimated to be about $25 billion and $20 billion, respectively. In minerals trade, Vietnam was a net importer because of its large imports of refined petroleum products ($2.41 billion), steel products ($1.64 billion), and manufactured fertilizers ($604 million). Vietnam's major exports of mineral commodities were crude petroleum ($3.78 billion) and coal ($180 million) in 2003 (Vietnam Panorama, 2004b§).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—To develop the bauxite resources of the Tan Rai District in the Province of Lamg Dong, Aluminium Pechiney of France completed a feasibility study for an integrated bauxite-alumina-aluminum facility during the third quarter of 2002. In December 2002, the feasibility study was submitted by state-owned Vietnam National Minerals Corp. (VIMICO) to the Ministry of Industry and the Prime Minister's office for approval. In June 2003, VIMICO announced that it would construct the $680 million bauxite-alumina-aluminum facility in the Bao Lam District in the Province of Lam Dong and that technical assistance would be provided by Pechiney. The facility, which was scheduled to be commissioned in 2006 or early 2007, will have the capacity to produce 2 million metric tons per year (Mt/yr) of bauxite and 300,000 metric tons per year (t/yr) of alumina, of which 140,000 t/yr will be smelted onsite to produce 72,600 t/yr of aluminum ingot for the domestic market. The electricity would be supplied from the nearby Ham Thuan Da Mi powerplant at the rate of 1 billion kilowatt hours per year (Pechiney, 2002; Vietnam News, The, 2002§; Interex.be, 2003§).

To develop the bauxite resources of the Dak Nong District in the Province of Dak Lak, the China Nonferrous Mining and Construction Group planned to update a prefeasibility study that it had conducted in 2001 on an estimated $1.5 billion bauxite-aluminum-processing complex at Dak Nong in the Province of Dak Lak. An agreement was reached between Vietnamese and Chinese officials in May 2002 to form a joint venture to develop the project. In December 2003, Aluminum Corp. of China reportedly agreed to join China Nonferrous Mining and Construction Group to update the prefeasibility study and to develop the bauxite mine in the Province of Dak Lak at an estimated cost of $1.35 billion (Mining-Journal.com, 2003; Vietnam Style.com, 2003a§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Copper.—According to Vietnam News Agency, VIMICO began ground work on the site of a $65 million copper mine and smelter complex at Sin Queyen in the Province of Lao Cai in September 2003. The construction work was scheduled for completion in late 2004 and a test run was to be held in the first quarter of 2005. Operations would begin in the second quarter of 2005. The mining and milling complex would have a capacity to mine and process up to 1.2 Mt/yr of ore to produce 42,000 t/yr of copper concentrate with an average metal content of 25% copper, 110,000 t/yr of iron ore; and about 20,000 t/yr of sulfur. The smelter would have a ca,acity to produce 10,500 t/yr of refined copper and byproducts, which could include 340 kilograms per year (kg/yr) of gold, 145 kg/yr of silver, and 40,000 t/yr of sulfuric acid. Copper ore resources in the area were estimated to be 50 million metric tons (Mt). According to VIMICO, the project would be financed by more than $40 million in soft loans from the Export-Import Bank of China. VIMICO would provide the remaining $12 million (Vietnam Style.com, 2003b§).

Gold.—Vietnam produced about 2 t/yr of gold. To meet the domestic demand for gold in 2003, the country reportedly imported about 50 t of gold, of which about 80% was imported through unofficial channels. To reduce the price of gold bar and to enable the manufacturers of gold jewelry to reduce their production costs and to be more competitive in the regional market, the Ministry of Finance reduced the tariff on gold bar imports to 1% from 3% and on gold grains to 0.5% from 1%, effective April 2004. According to the World Gold Council, the demand for gold in Vietnam had been growing at a rate of about 5% per year during the past several years and was about 59 t in 2003; jewelry manufacturers and private investors were the two major gold end users (World Gold Council, 2004§).

In a bid to liberalize Vietnam's small bullion market, the Vietnam Central Bank issued unlimited quotas for gold imports in May 2003. According to the State Bank of Vietnam, 14 gold traders and commercial banks had been permitted to import about 8 t of gold to stabilize the domestic market (Vietnamtrade.org, 2003b§; Yahoo.com, 2003b§).

In 2003, Olympus Pacific Minerals Inc. of Canada continued its gold exploration project at Phuoc Son in the Province of Quang Nam and moved closer to building a pilot plant in 2004. According to Olympus Pacific Minerals, its 2003 exploration program at the Phuoc Son gold project comprised 2,400 meters of diamond drilling and infill drilling at the Bai Dat and the Bai Go mineralized zones. In July, the company submitted an initial mining license application to the Government for a 0.5-km^2 area that covered the Bai Dat and the Bai Go zones within the Dak Sa shear zone (Olympus Pacific Minerals Inc., 2003a§, b§).

During 2003, Olympus Pacific Minerals conducted a feasibility study for the Bai Dat and the Bai Go deposits to develop an underground mine and a pilot plant with a capacity to process about 300 metric tons per day of ore; the deposits contain very high bonanza-grade gold mineralization that had been confirmed by the 2003 drilling program (Minesite.com, 2003a§, b§). According to Olympus Pacific Minerals, the total measured and indicated gold resources of the Bai Dat and Bai Go deposits was estimated to be 318,000 t at a grade of 14.32 grams per metric ton (g/t) gold that contained 147,000 ounces [4,570 kilograms (kg)] of gold. Inferred gold resources of the Bai Dat and the Bai Go deposits were estimated to be 188,000 t at a grade of 12.12 g/t gold that contained 74,000 ounces (2,300 kg) of gold (Olympus Pacific Minerals Inc., 2004§).

Iron and Steel.—Crude steel production rose to 544,000 t in 2003 from 319,000 t in 2001 because of increased tariffs on imports of billet in 2003. Crude steel was produced mainly by Thai Nguyen Iron and Steel Co. (TNISC), which had an annual capacity of 240,000 t, and Southern Steel Co. (SSC), which had an annual capacity of 200,000 t. TNISC and SSC were wholly owned subsidiaries of the state-owned Vietnam Steel Corp. (VSC). Vietnam's steel industry continued to have an imbalance between upstream (crude steel production) and downstream (rolled steel production) in 2003. Vietnam imported about 4.5 Mt of iron and steel products, of which 1.8 Mt was crude steel in the form of billets, to meet the domestic demand for crude steel by its growing number of rolling mills (Vietnam Panorama, 2004b§).

To reduce the country's reliance on imports of crude steel, VSC planned to build two new billet plants by 2005. In the south, SSC was to build a 500,000-t/yr steel billet plant in the Phu My industrial zone near Ho Chi Minh City in the Province of Ba Ria-Vung Tau. In March 2003, VSC awarded Danieli & Compagnia Officine Merecaniche SpA of Italy the $88 million contract to build the Phu My steel billet plant. According to VSC, the entire Phu My project, which included the billet plant and a new bar and rod mill, was expected to cost between $134 million and $150 million; SSC would invest $12 million, and the rest would be sourced from the Finance Ministry's Development Assistance Fund and domestic banks. VSC began preparation work on the project and construction of the southern plant in 2003; the project was scheduled for completion in late 2004 and would be ready for commissioning by early 2005. In the north, VSC planned to construct a 500,000-t/yr billet plant with an unspecified startup date at the Quang Ninh Steel Ingots Processing and Rolling Plant in Cai Lan on the coastal province of Quang Ninh (Southeast Asia Iron and Steel Institute, 2003c§; Yahoo.com, 2003a§).

In April, the Ministry of Industry appointed the consultancy arm of Arcelor S.A. to conduct the feasibility study for the building of a 4.5-Mt/yr integrated steelmaking complex in the Thach Ke District in the Province of Ha Tinh. A prefeasibility study for the Ha Tinh steelmaking complex had been completed by the Japan International Cooperation Agency in cooperation with a Japanese consortium led by Nippon Steel Corp. in 1996. The feasibility study would consider the construction of a $4 billion to $5 billion steel complex that would consist of one blast furnace, two electric arc furnaces, and one continuous slab caster and hot-rolling mill during the first phase. Subsequent phases would involve an additional blast furnace, billet caster, and bar mill. After completion of the entire project, the complex would have a total capacity to produce 3.5 Mt/yr of flat products and 1 Mt/yr of long products. The proposed Ha Tinh steel project would be totally separate from VSC's construction plan for the billet plants in the Provinces of Ba Ria-Vung Tau and Quang Ninh. According to the Ministry of Industry's forecast, domestic demand for steel could reach as much as 14 Mt/yr by 2020 (Southeast Asia Iron and Steel Institute, 2003a§, d§).

According to the Ministry of Trade and Custom Office, Vietnam's imports of iron and steel totaled 4.5 Mt in 2003, of which 1.8 Mt was steel billet. Imports of iron and steel were valued at $1.6 billion in 2003, of which $485 million was for steel billet (Vietnam Panorama, 2004b§).

In May 2001, Vietnam began to lower its import tariffs on iron and steel products and was to make further reductions by 2005 before participating in the Association of South East Asian Nations (ASEAN) free trade area agreement in 2006. To protect and support VSC's future billet plants to be built in the Provinces of Ba Ria-Vung Tau and Quang Ninh, the Government raised its tariff on imported billet from its ASEAN neighbors to 5% from 1% effective July 1, 2003. The tariff on imported billet from non-ASEAN countries was 10% effective January 1, 2004 (Southeast Asian Iron and Steel Institute, 2003b§).

Lead and Zinc.—Lead and zinc were produced by VIMICO from the Bac Thai, the Ha Giang, and the Yen Bai deposits. Annual production of zinc concentrate was about 40,000 t at a grade of about 30% zinc and 2.5% lead. The zinc concentrate was exported mainly to China and Thailand.

In September 2003, VIMICO began construction of Vietnam's first zinc smelter in the Province of Thai Nguyen, which was scheduled for completion by the third quarter of 2004. The smelter would have a designed capacity of 10,000 t/yr of zinc slab. A Chinese engineering company had been selected by VIMICO as the main supplier of the $13 million zinc smelter. The zinc concentrate for the smelter would be supplied from zinc deposits in the Provinces of Bac Can (Khan) and Thai Nguyen (Metal Bulletin, 2003; Mining Journal, 2003b).

Nickel.—Asian Mineral Resources Ltd. of New Zealand, through its wholly owned subsidiary AMR Nickel Ltd., continued to explore for copper and nickel in its 70% owned Ban Phuc Nickel property in the 150-km^2 Ta Khoa concession, which is located about 180 km west of Hanoi in the Province of Son La. Phase 1 of the feasibility study was begun and exploration for nickel and platinum-group metals continued in the concession area in 2003. The total resources, which included indicated resources of 6.44 Mt and inferred resources of 1.13 Mt, were estimated to be 7.57 Mt at a grade of 1.43% nickel, 0.29% copper, and 0.02% cobalt. The total resources of the Ban Phuc nickel sulfate deposit were estimated to contain about 108,000 t of nickel (Asian Mineral Resources Ltd., 2004§).

Tungsten.—In 2003, Tiberon Minerals Ltd (TM) of Canada continued to explore for tungsten, fluorite, and associated bismuth, copper, and gold at its 70% owned Nui Phao polymetallic property, which is located about 80 km north of Hanoi in Thai Nguyen Province. TM commissioned a prefeasibility study in April 2002, which was conducted and completed by AMEC E&C Services Ltd. in conjunction with Knight Piesold Consulting and Laurion Consulting Inc. of Canada. The company announced the results of its positive prefeasibility study in January 2003.

According to TM, the prefeasibility study proposed a $140 million project, which would carry a 21% internal rate of return, for an open pit operation with an annual throughput of 3.5 Mt of ore during a 16-year mine life; minable resources for the mining operation were estimated to be 55.2 Mt at grades of 0.213% tungsten trioxide, 0.213% copper, 0.102% bismuth, 0.223 g/t gold, and 8.0% fluorite. The processing facilities would produce 196,000 t/yr of fluorite with a 70% recovery rate, 6,000 t/yr of tungsten trioxide with an 80% recovery rate, 5,600 t/yr of copper with a 75% recovery rate, 155.5 kg/yr of gold with a 20% recovery rate, and 360 t/yr of bismuth with a 10% recovery rate (Mining Journal, 2003a; Tiberon Minerals Ltd., 2003b§).

In October 2003, TM announced that it had increased the mineral resources estimate for its Nui Phao tungsten-fluorite deposit and awarded the first two key contracts of the Nui Phao bankable feasibility study. According to TM, the 45 infill and step-out holes and 9 metallurgical holes that were drilled in 2003 had resulted in a 23% increase over the previous mineral resources estimate. The 2003 updated resources estimate represented a significant increase in the overall metal content of the Nui Phao deposit. The updated estimate, which was compiled by AMEC E&C Services and based upon a 0.20% tungsten trioxide equivalent cut-off grade, totaled about 88 Mt compared with the previous estimate of 55.2 Mt. Of the estimated 88 Mt of resources, 25.1 Mt was measured at a grade of .25% tungsten trioxide, 8.4% fluorite, 0.23% copper, 0.108% bismuth, and 0.26 g/t gold; 35.5 Mt was indicated at grades of 0.17% tungsten trioxide, 8.3% fluorite, 0.15% copper, 0.081% bismuth, and 0.16 g/t gold; and 27.4 Mt was inferred at grades of 0.16% tungsten trioxide, 7.1% fluorite, 0.17% copper 0.078% bismuth, and 0.15 g/t gold. In 2003, TM awarded the final environmental-social impact assessment contract to Knight Piesold of Canada and the final metallurgical test contract to SGS Lakefield Research of Canada. TM indicated that no additional drilling on the deposit would be conducted for the purpose of the bankable feasibility study in 2004 (Tiberon Minerals Ltd., 2003a§).

Industrial Minerals

Barite.—The state-owned Vietnam National Chemical Corp., through its subsidiaries, Investment Consultation for Construction and Mining Technological Development Co. in Hanoi, Thanh Hoa Secpentin Chemicals Co. in the Province of Thanh Hoa, Vietnam Appatite Co. in the Province of Lao Cai, and Vinh Chemical Co. in the Province of Nghe An, produced barite powder for domestic consumption and export. Barite powder was exported by the Tuyen Quang Branch of General Export Import Co., which was one of the leading manufacturers and suppliers of barite powder in Vietnam.

According to a local press report in 2002, Phuc Tinh Co. reportedly was to build a plant with the capacity to produce

40,000 t/yr of barite powder for the oil and gas industry in Nam Cam Industrial Park in the Province of Nghe An (Saigon Times Daily, 2002§).

Cement.—Because of the continued strong demand for cement by the construction industry, Vietnam's cement production increased by 19.5% to 23.3 Mt compared with 19.5 Mt in 2002. In 2003, Vietnam's cement was produced mainly by Vietnam National Cement Corp. (11.4 Mt) through its subsidiaries—Bim Son, But Son, Da Nang, Ha Tien I, Ha Tien II, Hai Phong, Hai Van, Hoang Mai, Hoang Thach, and Tam Diep; by numerous state- and local-government-owned cement-grinding companies (6 Mt) in various Provinces; and by 3 joint-venture companies (5.9 Mt)—Chinfong Hai Phong Cement Corp., which was located in Min Due near Hai Phong City; Morning Star Cement Ltd., which was located in Hon Chong in the Province of Kien Giang; and Nghi Son Cement Corp. which was located in Nghi Son in the Province of Thanh Hoa (Vietnamtrade.org, 2003a§; Cementtrade.com, 2004§; Vietnam Panorama, 2004a§).

To meet the strong demand for cement, Vietnam imported 3.55 Mt of clinker during 2003 and was expected to import 4.5 Mt of clinker during 2004. According to the Vietnam Building Materials Association, the cement industry planned to meet demand by producing 29 Mt of cement in 2005, upgrading its outdated equipment and technology, expanding its existing plants, and building new plants. Industry officials warned that a severe cement shortage could develop as early as 2004 unless the industry invested more in production facilities. The Ministry of Construction projected that demand for cement could reach 25.7 Mt in 2004 and expected a shortfall of cement owing to higher demand by the construction industry (International Cement Review, 2003; Vietnam Economy.com, 2004§).

In 2003, the Government approved several new cement projects. Donafrance Cement Joint Venture Co. (a joint venture of Dong Nai Roofsheet and Construction Materials Joint Stock Co. of Vietnam and Vture Pte Ltd. of France) planned to build a cement plant with an initial investment capital of $23 million in Nhon Trace District in the Province of Dong Nai. Vietnam Construction Import-Export Corp. planned to build a 2.3-Mt/yr cement plant in Cam Pha in the northern Province of Quang Ninh and a crushing plant in Tan Thanh District in the southern Province of Ba Ria-Vung Taun for a total estimated cost of $312 million (Accessvietnam, 2003§; Mekong Sources, 2003a§).

Other projects initiated in 2003 included the $53 million project by Holcim (Vietnam) Ltd. (a joint venture of the Holcim Group of Switzerland and Vietnam Cement's Ha Tien Cement 1 Co.) and the $210 million project by Nghi Son Cement Corp. The Holcim project involved the construction of a 1.3-Mt/yr Thi Vai cement-grinding plant in the Phu My Industrial Zone 1, which is located in Tan Thanh District in the Province of Ba Ria-Vung Tau. The cement-grinding plant, which would be expanded to 3.6 Mt/yr in the future, was scheduled for completion in 2004. The Nghi Son project involved the capacity expansion of the company's Nghi Son plant to 4.3 Mt/yr by 2005; the plant is located in the Province of Thanh Hoa (Cementtrade.com, 2003§; Nhan Dan, 2003§).

Chinfong Hai Phong Cement, which had planned to expand its capacity to 2.6 Mt/yr by 2005, asked the Ministry of Planning and Investment to resolve its dispute with Vietnam Cement Corp. concerning that company's increase of its equity holdings in their joint venture. The dispute involved a $170 million expansion plan proposed by the Chinfong Group of Taiwan. Vietnam Cement was insistent that it would not approve the expansion plan unless Chinfong agreed to sell part of its 70% stake in the joint venture to Vietnam Cement Corp. (Vietpartners.com, 2003§).

Mineral Fuels

Coal.—Coal was the second most important mineral commodity, after crude petroleum, produced in Vietnam. In the domestic market, coal was consumed as the main fuel for thermal powerplants; as the primary fuel for the manufacturers of cement, chemicals, metals, paper, and processed foods; and as cooking fuel for rural and urban households. In the export market, coal was one of the major export commodities to earn foreign currency. Because of its high heat value and low content of ash, nitrogen, phosphor, and sulfur, Vietnamese anthracite retained a large-percentage share of the anthracite market in Japan and Western European countries, where strict environmental regulations were being implemented (Le Tri Hung, 2002§).

Between 1999 and 2003, Vietnam's coal-mining capacity doubled, coal production rose by 97% to 19 Mt, and coal exports increased by more than 100% to 7 Mt in 2003. Vietnam National Coal Corp. (Vinacoal) controlled most of the mining, distribution, and export of coal. Most of the coal produced in Vietnam was anthracite mainly from the Province of Quang Ninh in northeastern Vietnam.

According to Vinacoal, two major coal mines—the Cua Ong and the Hon Gai, which used new technology imported from Australia and had a combined capacity of 5 Mt/yr—were capable of processing coal at the mine site to meet customers' specifications. Other major coal mines were in the Cam Pha, the Cao Son, the Coc Sau, the Deo Nai, the Dong Trieu, the Ha Tu, the Mao Khe, the Mong Duong, and the Uong Bi areas. Production of brown coal was mainly from the Na Duong Mine, which is located in the Province of Lang Son.

In previous years, the Vietnamese coal industry had invested more than $116 million on new imported equipment and technology to expand its coal-production capacity. The new investment included exploration devices, heavy-duty excavators, transport trucks, conveyer belts, hydraulic equipment for deep underground mines, and equipment to improve the safety and productivity of miners in the Districts of Ha Lam, Ha Long, Hon Gai, Mao Khe, Mong Duong, and Uong Bi in the Province of Quang Ninh (Vietnam News, The, 2004a§).

The Vinacoal's expansion projects have been undertaken at the Cao Son, the Khe Cham, the Khe Tam, the Mao Khe, the Nui Beo, the South Ha Tu, the Vang Danh, and the Yen Tu Mines, all in the northeastern part of the country. In February 2003, Vinacoal announced that it planned to open six new coal mines in the Province of Quang Ninh during the next 7 years. The mines would be located at Coc Sau, Khe Cham, and Nga Hai. Four of the six mines would be at Khe Cham and were expected to cost $162.3 million to develop. The Khe Cham No.

1 Mine was expected to produce 600,000 t/yr by 2004; the Khe Cham No. 2 Mine was expected to open in 2007 and to reach full capacity of 1.2 Mt/yr by 2009; the Khe Cham No. 3 Mine was designed to produce 1.5 Mt/yr by 2010; and the Khe Cham No. 4 Mine, which opened in late 2003, had a capacity of 1.5 Mt/yr. The Coc Sau Mine was expected to begin producing 500,000 t/yr by 2005, and the Nga Hai Mine, from 1.2 to 1.6 Mt/yr in 2006. According to Vinacoal, the six new mines would boost Vietnam's coal production by more than 30% in the Cam Pha area within the next 3 years and would reach 11.5 Mt in 2005 and 18 Mt in 2010 (Mekong Sources, 2003b§).

According to Vietnam Government Decision No. 20/2003 (on orientation for the coal industry in the 2003-10 planning period), the Government set a target to produce between 23 and 24 Mt of coal in 2010 and between 29 and 30 Mt in 2020. To increase the country's coal output, the coal industry would need $925 million of capital investment in infrastructure projects between 2003 and 2010 (Japan Coal Center, 2003§).

In 2003, Vietnam's exports of anthracite totaled 7 Mt and were valued at $181 million. Vietnam's exports of anthracite went mainly to China, the European Union member countries, Japan, Thailand, and other ASEAN member countries (Vietnam Panorama, 2004b§).

Natural Gas and Petroleum.—Natural gas was produced by VietSovPetro [a joint venture of Vietnam Oil and Gas Corporation (PetroVietnam) and Zarubeznheft of Russia] from the small onshore Tien Hai C Gasfield in the Hanoi Trough (part of the Song Hong Basin); associated gas was produced from the larger offshore Bach Ho and Rang Dong Oilfields, which are located in the Cuu Long Basin. In 2003, natural gas production increased by 52.7% to 3.45 billion cubic meters and averaged about 9.45 million cubic meters per day (Vietnam News, The, 2004b§). In the domestic market, about 2.4 billion cubic meters of natural gas was consumed as fuel for power generation at the Ba Ria and the Phu My electric powerplants; the remainder was consumed as raw materials by the liquefied petroleum gas (LPG) and condensate processing plants at Dinh Co for the production of LPG and gasoline in Vung Tau in the Province of Ba Ria-Vung Tau.

In December 2003, the Japan Vietnam Petroleum Company completed installation of a new platform in the Rang Dong Oilfield. The associated gas from the field was to be transported onshore at the rate of 1.7 million cubic meters per day for use by powerplants in southern Vietnam. The $140 million platform comprised three subprocessing platforms, a jacket system, and two bridges. The Rang Dong Oilfield was owned by Japan Vietnam Petroleum (52.5%), ConocoPhillips Company (30%), and PetroVietnam Company Ltd. (17.5%) (Vietnam News, The, 2003§).

BP and its partners, ConocoPhillips, ONGC Videsh Limited of India, and PetroVietnam, brought the first phase of the $1.3 billion Nam Con Son project onstream and delivered the first gas in November 2002. The project included development of an offshore gasfield; construction of a 399-km pipeline to carry the gas ashore; development of onshore gas-processing facilities; and construction of the 716-megawatt Phu My 3 powerplant, which was expected to come onstream in late 2003. During the first phase of the project, up to 3 billion cubic meters per year of gas would flow ashore to provide power to feed Vietnam's growing industrial base. The gas project tapped reserves discovered in the Lan Do and the Lan Tay Gasfields in block 06-1. The two fields were estimated to contain 58 billion cubic meters of gas reserves and were expected to supply gas for the next 20 years (BP.com, 2002§).

Crude petroleum was produced by PetroVietnam in joint venture with foreign partners from Canada, France, Japan, Malaysia, Russia, Sweden, and the United States. According to the General Statistical Office, Vietnam produced about 17.69 Mt, or an average of 343,200 barrels per day (bbl/d), of crude petroleum in 2003. Vietnam exported 17.17 Mt of crude petroleum and earned $3.78 billion of foreign currency in 2003 (Vietnam Panorama, 2004a§, b§).

According to PetroVietnam, crude petroleum was produced from six offshore oilfields in three basins—the Bach Ho, which averaged 245,300 bbl/d; the Rang Dong, which averaged 43,000 bbl/d; the Ruby, which averaged 21,000 bbl/d, and the Rong, which averaged 12,000 bbl/d and are located in the Cuu Long Basin; the Bunga Kekwa, which averaged 14,000 bbl/d, is located in the Malay-Tho Chu Basin off the southern coast of Vietnam between Vietnam and Malaysia; and the Dai Hung, which averaged 2,700 bbl/d, is located in the Nam Con Son Basin. The output from the Bunga Kekwa was shared equally by Vietnam and Malaysia. The output from the Rang Dong Oilfield could be raised to 70,000 bbl/d from 43,000 bbl/d after two new derricks (S1 and E1) are installed and operational (PetroVietnam, 2003§).

ConocoPhillips (23.25%) and its partners in the Cuu Long Joint Operation Co. (CLJOC) [PetroVietnam (50%), Korean National Oil Corp. (14.25%), SK Corp. (9%), and Geopetrol S.A. (3.5%)] brought the SuTu Den Oilfields onstream; these oilfields had estimated reserves of 500 million barrels in block 15-1 offshore Vietnam's southeast coast in October 2003. The initial production rate was about 60,000 bbl/d from seven wells in the Phase I area. ConocoPhillips and its partners in CLJOC reportedly discovered oil and gas in the 15-1-ST-1X exploratory well in the SuTu Trang field. Three zones tested at a combined rate of 8,682 bbl/d of oil and about 2 million cubic meters per day of natural gas (Oil & Gas Journal, 2003a; Soconord Group, 2003§). In late December, Talisman Vietnam (30%) and its partners PetroVietnam (40%) and Petronas Carigalis Overseas Sdn Bhd. (30%) reportedly also made an oil discovery in block 46/02 offshore Vietnam in the Song Doc prospect; a test drill was flowing at the rate of 7,300 bbl/d.

Outlook

For the next 4 to 5 years, Vietnam's mining sector will continue to be dominated by the oil and gas industry. Development of new capacity in copper, gold, and zinc production was expected to be completed within the next 2 to 3 years, but development of new capacity in other nonferrous metals, which includes aluminum, may take longer. The cement and coal industries are expected to expand their capacity to meet the fast-growing demand for cement by the construction industry and for coal by new thermal powerplants during the next 7 to 10 years.

Vietnam's economy is expected to continue to grow at the same pace as that of 2003 during the next 2 years. According to a forecast by the International Monetary Fund (2004§), the Vietnamese GDP was estimated to grow at 7% in 2004 and 2005.

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TABLE 1
VIETNAM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1999	2000	2001	2002	2003[p]
Barite[e]		25,000	52,500	71,100	60,300	81,500
Cement, hydraulic	thousand tons	10,489	13,298	16,073 [r]	19,481 [r]	23,282
Chromium ore, gross weight		58,500	76,300	70,300 [r]	71,000 [r]	75,000 [e]
Clays, kaolin[e]		200,000	520,000	600,000	600,000	650,000
Coal, anthracite	thousand tons	9,629	11,609	13,397 [r]	16,347 [r]	18,963
Copper concentrate, gross weight[e]		15,000	15,000	2,000	5,000	10,000
Fluorspar[e]		3,000	3,000	3,000	3,000	3,000
Gas, natural, gross	million cubic meters	1,435	1,598	1,724	2,260	3,450
Gold[e]	kilograms	1,500	3,000	3,000	2,000 [r]	2,000
Ilmenite, gross weight[e]		91,000	174,000	180,000	180,000	200,000
Lead, mine output, Pb content[e]		1,000	1,200	900	1,100 [r]	1,100
Lime	thousand tons	1,026	1,156	1,351 [r]	1,426 [r]	1,450 [e]
Manganese concentrate, gross weight[e]		65,000	65,000	67,000	68,000	68,000
Nitrogen, N content of ammonia		33,000	41,900	52,600	58,400	79,700
Petroleum, crude	thousand 42-gallon barrels	107,767	115,373	119,212 [r]	117,753 [r]	125,281
Phosphate rock:						
Gross weight	thousand tons	681	785	677 [r]	680 [r]	700 [e]
P_2O_5 content	do.	204	236	204 [r]	204 [r]	210 [e]
Pyrite, gross weight[e]	do.	150	200	300 [r]	400 [r]	450
Pyrophyllite[e]		20,000	30,000	30,000	30,000	30,000
Salt	thousand tons	653	590	669 [r]	755 [r]	800 [e]
Sand and gravel	do.	77,800	83,200	92,200 [r]	95,000 [r]	98,000 [e]
Silica sand[e]	do.	60,000	60,000	62,000	62,000	63,000
Steel:						
Crude	do.	308	306	319	409 [r]	544
Rolled	do.	1,357	1,583	1,914 [r]	2,429 [r]	2,682
Stone, building stone	do.	49,800	57,600	80,400 [r]	83,700 [r]	85,000 [e]
Sulfur[e]		22,000	22,000	22,000	22,000	22,000
Tin:						
Mine output, Sn content[e]		4,000	4,100	4,500	4,500 [r]	4,600
Metal, smelter		1,693	1,800 [r]	1,131 [r]	1,200 [r]	1,300 [e]
Zinc, mine output, Zn content[e]		12,300 [r]	12,500 [r]	7,500 [r]	12,000 [r]	12,000
Zirconium, gross weight[e]		2,500	5,000	5,400	5,500	5,500

[e] Estimated; estimated data are rounded to no more than three significant digits. [p] Preliminary. [r] Revised.

[1] Table includes data available through August 6, 2004.

[2] In addition to the commodities listed, bauxite, benonite, refractory clay, construction aggregates, gemstones, granite, graphite, iron ore, marble, and rare earths were mined, but not reported. Available information is inadequate to make reliable estimates of output levels.

Sources: Vietnam's General Statistics Office, Statistical Yearbook, 2002; British Geological Survey, World Mineral Statistics, 1992-99; World Metal Statistics, April 2004; South East Asia Iron and Steel Institute, Crude Steel Production, Annual Statistics, 1994-2003; U.S. Geological Survey Minerals Questionnaire, 2000 and 2001; The Barytes Association, World Barytes Production 2000-03.

TABLE 2

VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operation companies and major equity owners	Location of main facilities	Annual capacity
Cement		Chinfong Hai Phong Cement Corp. (Chingfong Group of Taiwan, 70%; Hai Phong Municipal Government,15.56%; Vietnam National Cement Corp., 14.44%)	Min Duc near Hai Phong City	1,400
Do.		Morning Star Cement Ltd. (Holcim Group of Switzerland, 65%, and Vietnam National Cement Corp.—Ha Tien I, 35%)	Hon Chong, Kien Giang Province	2,300
Do.		Nghi Son Cement Corp. (Taiheiyo Cement Corp. and Mitsubishi Materials Corp. of Japan, 65%, and Vietnam National Cement Corp., 35%)	Nghi Son, Thanh Hoa Province	2,150
Do.		Vietnam National Cement Corp. (100% state owned)	Bim Son, But Son, Da Nang, Ha Tien I, Ha Tein II, Hai Phong, Hai Van, Hoang Mai, Hoang Thach, and Tam Diep	12,000
Chromite		Thai Nguyen Nonferrous Metal Co. (wholly owned subsidiary of state-owned Vietnam National Minerals Corp.)	Nui Nua, Thanh Hoa Province	80
Coal, anthracite		Vietnam National Coal Corp. (100% state owned)	Cam Pha, Cao Son, Coc Sau, Vang Danh, Dong Trieu, Ha Lam, Ha Tu, Hong Gai, Khe Cham, Mao Khe, Mong Duong, Cua Ong, Uong Bi in Quang Ninh Province	19,000
Fertilizer:				
Apatite		Vietnam National Chemical Corp. (100% state owned)	Lao Cai, Lao Cai Province	700
Superphosphate		do.	Lam Thao, Phu Tho Province	800
Gas, natural	million cubic meters per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubezneft, a Russian oil company)	Offshore Bach Ho Oilfield	5
Iron ore, pyrite		Mineral Development Co. No. 3 and Geological & Mineral Mining Enterprise 304 (wholly owned subsidiaries of Vietnam National Minerals Corp.)	Ba Vi District, Ha Tay Province; Duyen Hai Quarter, Lao Cai Province	200
Nitrogen, ammonia		Vietnam National Chemical Corp.	Ha Bac, northern Vietnam	55
Petroleum, crude	thousand 42-gallon barrels per day	VietSovPetro	Offshore Bach Ho and Rong oilfields	330
Salt		Vietnam National Salt Corp.	Nam Dinh, Nghe An, and Hai Tin Provinces	850
Steel, crude		Vietnam Steel Corp.	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	450
Tin:				
Concentrate		Cao Bang Nonferrous Metal Co. and Nghe Tinh Nonferrous Metal Co. (wholly owned subsidiaries of state-owned Vietnam National Minerals Corp.)	Pia Oac, Cao Bang Province; Quy Hop, Nghe An Province; and Tam Dao, Tuyen Quang Province	4
Refined		Thai Nguyen Nonferrous Metal Co.	Thai Nguyen, Bac Thai Province	2
Titanium, ilmenite		Bimal Minerals Co. Ltd. (Binh Dinh Minerals Co., 40%, and Malaysia Mining Corp. and Syarikat Pendorong Sdn. Bhd., 60%)	Cat Khanh, Qui Nhon, and Binh Dinh Provinces	70
Do		Ha Tinh Minerals and Trading Co.	Cam Hoa, Ky Anhh-Cam, Xuyen, Ky Khan, and Ky Ninh, Ha Tinh Province	130
Do.		Mineral Development Co. No. 4 and No. 5 (wholly owned subsidiaries of Vietnam National Minerals Corp.)	Vinh City, Nghe An Province; Tuy Hoa, Dong Xuan in Phu Yen Province; and Quang Ngan, Vinh My in Thua Thien-Hu Province	50
Zinc, concentrate		Thai Nguyen Nonferrous Metal Co. (wholly owned subsidiaries of Vietnam National Minerals Corp.)	Cho Dien, Bac Can Province	45

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